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[Communicated, No. I.]

Catalytic Action on Combustible Gases in the Generation of Steam.

By MR. EUGENE C. SMITH.

There are annually used in the business and other structures of New York City 7,000,000 tons of coal, 87½ per cent. of the heat value thereof being lost through neglect or incomplete attention during the various steps of handling and burning. From the entrance of the coal into the premises till the ashes are set on the sidewalk, these 7,000,000 tons of coal at $6 per ton figure an expenditure of $42,000,000. As only 12½ per cent. of this enormous pile of coal is usefully applied in its burning, 7 out of every 8 tons consumed are wasted. To differentiate this statement, the coal usefully applied costs us $48 per ton instead of $6. Is it to be wondered at that landlords swear, that tenants freeze, that the janitor looks for a new business opportunity, and that the courts refuse to act in suits over broken leases?

There are 250,000 furnaces within a short radius of New York, each furnace being the center of a turmoil of riotous destruction, often breeding some form of distress or discomfort to each person within its cycle of action, except to the coal man; but, at this rate of destructive consumption of coal, he will get his. Later on, will soon come a time when the coal will have been mined and consumed, and there will be no coal to sell at a dollar to give only 12½ cents worth of satisfaction to the buyer.

Has our boasted acquirement in chemical, physical and mechanical knowledge, no solution to offer—no devising of ways or means whereby some of this enormous loss in coal may be saved to future generations?

Every industry, directly or indirectly, is the practical application of some fact of physics or of chemistry, which the patient ingenuity of man has crystallized into a definable method, process or rule of conduct; and, singularly too, so co-related and interwoven—so greatly interdependent upon each other are these various industrial processes that they represent a vast fabric wherein each fiber is caused to perform its highest degree of usefulness with the greatest degree of economy. All except that black, sullen, resentful giant, the coal pile. Man's efforts for centuries would seem like the attacks of vast armies on a monster of strength, whom, failing to subdue and render submissive, they would destroy piecemeal and render useless. Sir Humphrey Davy, an Aladin of science, rubbed a lamp. The geni of coal has become our slave.

It is not the purpose of this article to enter into the heat values of coal, coal gas, or other forms of combustibles. Nor to indicate preference for any of the various methods or apparatus designed for their more or less perfect combustion, and greater or less efficiency in the direction of heat developed to the service required, these phases are commonly known to those whose business it is to possess such knowledge the world over. For the purpose of this article these ways and means may all be characterized as destructive and wasteful.

Almost a century since, a new era dawned. Thinking men the world over marveled and experimented and wrote observations of their efforts to learn more of the strange phenomena. Sir Humphrey Davy had discovered that coal in the form of a gas would combine with the oxygen of the air, when in contact with any one of numerous substances, these agents were termed Catalyzers. It was further discovered these agents were in no way affected by the gases combined nor by the heat evolved during the chemical action of the gases in getting together.

The list of English, French and German savants who subsequently investigated the phenomena is long, and embraces the name of every distinguished scientist of Europe during the next 50 years.

The observations of the illustrious experimentors, Doberenier, Edmund Davy, Faraday, De la Rive, Bottger, Gruelion Liebig and many others form a fragmentary history of all that had been learned. No industrial use to which the strange performance might be harnessed had been evolved. Later came Philips, the vinegar maker, and that brilliant coterie of Germans, Kneitsch, Meyer, Schroeder, Hasenbach. A new process for the manufacture of indigo, and another for making sulphuric acid, were evolved and operated for 5 years to the great disturbance of the trade in both industries before the world knew truly what had happened. Many new catalytic agents were discovered. It was learned that the combination of hydrogen and oxygen, when heated, was due to the presence in those gases of an

infinitely small quantity of water. Heat alone had no effect on perfectly dry gases. Water, therefore, was added to the already lengthy list of catalyzers.

Another investigator has discovered that a tank of water could be so treated that it assumed a critical state, at which period a minute crystal of ice being placed in the tank, the ice crystal would instantly enlarge, would build up as it were, till the whole tank of water would become a solid block of ice.

These are a few of the many strange things brought to lighl by the patient investigators of catalysis, looking always to its industrial application. My mission has to do with the coal pile. Its destructive waste by the present method of burning it in lumps, and the great saving promised us from the combustion of coal, in the form of gas, by catalytic action.

It is readily conceivable, with our present knowledge of the chemical action called combustion, that irrespective of the fact that a body of mixed hydrocarbon and oxygen gases may be chemically balanced as a whole there is no assurance of arrangement or alignment of its particles in their chemical proportions. The movement of the particles of gases in the furnace is eratic. When a chemical balance of particles does occur the center of its action is isolated, with the hit-or-miss condition of other particles unaltered.

It is in the nature of things, there being no medium for the molecular control of the particles of gases, they must obey other laws in their wild swirl of movement to the outer space—the particles undeveloped to a new chemical form or their energy—heat, expended in other than the intended useful manner. These facts hold good whether the gas is evolved within the furnace from coal in lumps, or is manufactured elsewhere and led to the furnace and fed from pipes, the results spell destruction and waste. It is the curious property of a catalyzer that it will select and combine a chemical balance of the hydrocarbon aad oxygen. The cycle of action is complete and undisturbed by the presence of the nitrogen necessarily accompanying the oxygen. Heat is evolved, the action of the catalyzer becomes quickened, the next cycle of combining a group of gaseous particles is more rapid, and so on for a period determined only by the supply of gases, the catalyzer at no period entering into or becoming a part of the compound formed from the gases. Always alert and active when the gases are within its sphere of action, to-day, to-morrow or a year hence, it will attend exclusively to its business. It permits of no escape of particles of gases undeveloped. There is no waste.

There is no commercially practicable apparatus or method known, other than catalysis, which insures combustion without loss.

The average type of steam boiler supplying heat to the conventional apartment or tenement house presents a set of conditions regarding its service most astonishing to anyone closely investigating all the circumstances of its management. There are many details of neglect brought about either willfully or through ignorance. Bad firing, operating of firing doors for an improper period of time, imperfect insulation of the boiler and the steam pipes leading therefrom, leakage of steam and water, the too frequent recharging of the boiler with cold water, the insulation both inside and outside of the surfaces for transmitting heat to the water. All these things, and many others, added to the imperfect combustion inherent in the method of burning coal, make a sum total of loss well worth while to save.

The writer has given much time and thought to this, and after numerous experiments has evolved a set of porous catalytic plates which take the place of the ordinary grate bars usually used. This new form of grate takes the shape of a horizontal partition across the ordinary passageway for the outer air through the ashpit and upward among the boiler flues to the outer air. These grates have a gas connection with the city gas supply. Great care has been taken in planning the adaptation of the catalytic grates to this service, so that there would be no alteration or disturbance of any functional feature of the steam boiler already installed. The steam and water gauges, the blow-off valve, the draught damper and its controlling steam diaphragm, everything remains the same, the gas connection being controlled by the steam diaphragm, so as to make the inflow of air and gas co-ordinate with the temperature and pressure required from the steam.

Some idea may be obtained of the relative efficiency of using coal in lumps and using coal in its finely divided or gaseous state, when it is learned that 10,000 cubic feet of illuminating gas (the product of 1 ton of coal), when used catalytically, one equal to 8 tons of coal consumed in the ordinary way.

Second Annual Dinner—Entertainment, Commercial Department, New York Consolidated Gas Company.

The second annual dinner and entertainment of the Commercial Department, the Consolidated Gas Company, of New York, was held Saturday evening, February 17th, at "Reisenweber's." More than 300 employees of the department were present. The guests of the evening were the officers of the Company, the heads of various departments and the officers and superintendents of affiliated Companies who were formerly connected with the Commercial Department of the Consolidated Company. Seated at the guest tables were the following:

OFFICERS.

George B. Cortelyou, President.
Robert A. Carter, Vice-President and Secretary.
Colin C. Simpson, Assistant Secretary.
Henry M. Brundage, Assistant Secretary.

HEADS OF DEPARTMENTS.

G. E. Woods, Asst. Chief Engineer and Engineer of Manufacture.
W. Cullen Morris, Engineer of Construction.
Gilbert Francklyn, Engineer of Distribution.
Oscar H. Fogg, Engineer.
Edwin North, Purchasing Agent.
C. C. Simpson, Jr., Engineer, Department of Mains.
I. C. Kingsbury, Superintendent, Hester Street (Street) Department.
John Nelson, Superintendent, 111th Street (Street) Department.
W. D. Kelley, General Superintendent of Meters.
A. E. Turner, Assistant General Superintendent of Meters.
W. T. Howlett, Superintendent, Hester Street meter shop.
F. X. Murray, Superintendent, 66th Street meter shop.
G. B. Bridgeworth, Superintendent, 102d Street meter shop.
J. C. Brady, Superintendent, 159th Street meter shop.
C. G. Smith, Commercial Department Branch Superintendent.
Henry Simpson, Commercial Department Branch Superintendent.
J. R. Fenniman, Commercial Department, Branch Superintendent.
H. B. Reinach, Asst. General Supt., Commercial Department.

FORMERLY OF COMMERCIAL DEPARTMENT, CONSOLIDATED GAS COMPANY.

W. J. Clark, Vice-President, Westchester Lighting Co.
E. S. Bellows, Asst. Sec. and Treas., Westchester Lighting Co.
F. R. Devoe, Secretary, Northern Union Gas Co.
L. H. Werner, Secretary, Central Union Gas Co.
W. E. Shepard, Supt. Com. Dept., Central Union Gas Co.
E. B. Hyde, Supt. Com. Dept., New Amsterdam Gas Co.

REPRESENTING THE COMMITTEE.

Frank R. Barnitz, Gen. Superintendent, Commercial Department.

At the conclusion of the dinner, Mr. Frank R. Barnitz, General Superintendent of the Commercial Department, representing the Committee of Arrangements, welcomed the guests in behalf of the Department.

Mr. Barnitz spoke of the good effect of the annual dinners in bringing together the men of the various branches, renewing the friendships and creating a feeling of good fellowship among all the men. He complimented the representatives of the other Companies who were "graduates" of the Commercial Department and pointed to their progress as an incentive to the present employees of the department. In welcoming the Heads of other Departments of the Consolidated Company, Mr. Barnitz said: "Our aim has olways been to work together with all departments so that good service will be given to gas consumers and that the conditions under which we labor may be improved by harmonious relationship." After a word of thanks to the Committee of Arrangements for their services in connection with the dinner, Mr. Barnitz introduced President George B. Cortelyou to whom he expressed the deep appreciation of the employees for the great interest he so often manifested in them.

Mr Cortelyou, after telling a few humorous stories, spoke of the loyalty of the Company's employees and cited the recent labor agitation as an example of their faithfulness. "Not one man" said Mr. Cortelyou, "who was physically fit to report for duty failed to do so." Mr. Cortelyou offered some very sound advice on the relation of a public service corporation employee to the public and the corporation, and closed by proposing a toast to Mr. Harrison E. Gawtry, Chairman of the Board of Directors, and his associate officers of the Company.

In introducing Mr. Robert A. Carter, Vice President and Secretary and active head of the commercial department, Mr. Barnitz recited a poem entitled "The Man Who Delivers the Goods." The employees were quick to appreciate its appropriate application to Mr. Carter and he received a tremendous ovation when he rose to speak. He spoke of the importance of the work of the commercial department and the great responsibility which rests upon those who have it in charge. On the 26th of February Mr. Carter will have rounded out 35 years of service with the Consolidated Gas Company, and his career having been a steady climb from the "lowest rung," his review of the many changes in the business which have occurred during his years of service was extremely interesting to the present day "Commercial Man." Mr. Carter did not forget those who make the gas business possible, and closed amid great enthusiasm on a toast to "Our Customer."

An excellent array of vaudeville talent was arranged for the entertainment, and the entire programme was thoroughly enjoyed. The Committee of Arrangements comprised:

Branch No. 1.—Charles Werner and S. B. Bruce. Branch No. 2.—C. D. Immen Jr., and S. N. Johnson. Branch No. 4.—J. B. Daly and E. T. Graham. Branch No. 5.—John J. Kelsh and Thos. C. Barker. Branch No. 6.—W. G. Peterson and L. C. Strube.

Fuel Appliance Dept.—J. J. Creeden and A. L. White.

General Office.—J. H. N. Armstrong and Wm. DeHart.

Ex-Officio.—W. G. Morris, Chief Clerk, Accounting Department; J. B. Collins, Asst. Supt. Branch 1; W. B. Irwin, Asst. Supt. Branch 2; A.. C. Johnson, Asst. Supt. Branch 4.; G. W. Thompson, Chief Clerk, Branch 5; C. E. Reuss, Asst. Supt. Branch 6; H. B. Reinach, Asst. General Superintendent.

[Continued from Page 155.]

PROCEEDINGS, SIXTH ANNUAL MEETING, AMERICAN GAS INSTITUTE.

Held in St. Louis, Mo., October 18 to 20, 1911.

Second Day—Morning Session.—Section A.

The meeting (Section A) having been opened, the President said the first paper would be that by Mr. Warren S. Blauvelt, entitled

THE DEVELOPMENT OF A BY-PRODUCT COKE OVEN GAS PLANT,

which was read by the author as follows:

In December, 1899, the New England Gas and Coke Company began delivering its surplus gas from the by-product coke oven plant at Everett, for general distribution and sale as illuminating and fuel gas. The following year this pioneer plant sold for general distribution 1,427,155,000 cubic feet of gas. During the 12 years which have nearly elapsed since the Everett plant commenced operation, the number of coke oven plants in the United States from which surplus gas is sold for illuminating purposes, has increased to eleven; the total sales of coke oven gas for general distribution have increased each year, except in 1908, until in 1910 they exceeded 12,000,000,000 cubic feet, or approximately 23 per cent. of the total coal gas sold. Of the 11 coke oven plants now delivering illuminating gas, all except one have been operated continuously since they started. In view of this record in the gas business of the United States, it is evident that the by-product coke oven method has, in the past 12 years, won for itself an enviable position among the standard methods for the manufacture of fuel and illuminating gas.

The by-product oven was developed primarily for the purpose of manufacturing metallurgical coke; hence, comparatively little attention was given, either in the design or operation of the older plants, to those problems, upon the proper solution of which, depended the success of the by-product oven as a gas retort. The yield of surplus gas was invariably low, seldom exceeding 60 per cent. of the yield obtained by good practice at the present time from similar coal. The calorific power of the gas was generally low and subject to great variations, and no satisfactory method of controlling the illuminating power of the gas had been worked out.

The first by-product coke oven plant built in this country was a block of 12 Semet-Solvay ovens, at Syracuse, N. Y., which commenced operation in 1893. This plant was so successful that 13 additional ovens were built and went into service in 1896. The same year some interesting experiments were made to determine the practicability of firing the ovens with producer gas instead of oven gas. A detached gas producer was set up; the gas was cooled, scrubbed to remove dust, and then burned in the oven flues. This experiment was entirely successful in proving the possibility of firing ovens with producer gas, thus securing the entire make of oven gas for general distribution.

In October, 1902, the Semet-Solvay plant, at Detroit, Mich., began the delivery of its surplus gas to the Detroit City Gas Company. This plant has been used as an experimental station for working on many of the problems of design and operation of coke oven plants and the manufacture of illuminating gas. It is the author's purpose in this paper to tell something of the progress made during the past 9 years at the Detroit plant in the manufacture of illuminating gas in by-product coke ovens.

When the delivery of illuminating gas commenced, the plant consisted of 30 ovens which had been operated about 13 months, with 30 ovens still under construction which were completed the following December. These ovens were 30 feet long, 7 feet high, with an average width of 16½ inches. The regular oven charge was 6 tons of coal. The general design of these ovens is clearly shown in the drawings Fig. 1 and Fig. 2. The oven heating flues were made of large Belgian tile; as there were 4 of these superimposed flues on each side of the ovens they were called 4-high ovens. Clay firebrick were used in the division walls and in the recuperator flues, which, as may be seen from the drawing, were directly below the oven chamber. The combustion gases after leaving the recuperators passed to waste heat boilers, where they were utilized in generating steam, finally escaping at a temperature of about 550° F.

The general plan of the plant, as it now exists, is shown in Fig. 3.

Fig 1.

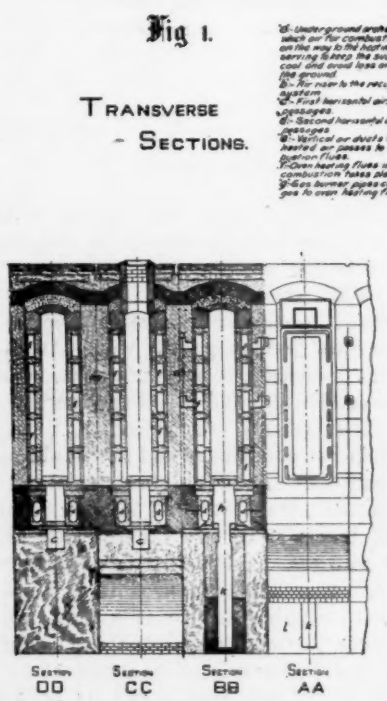
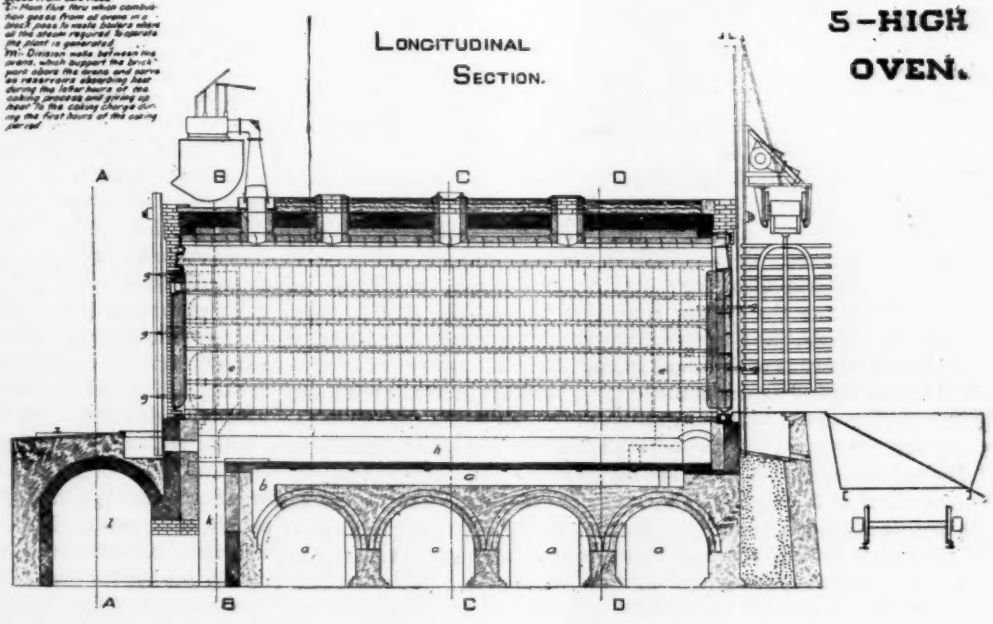


Fig 2.



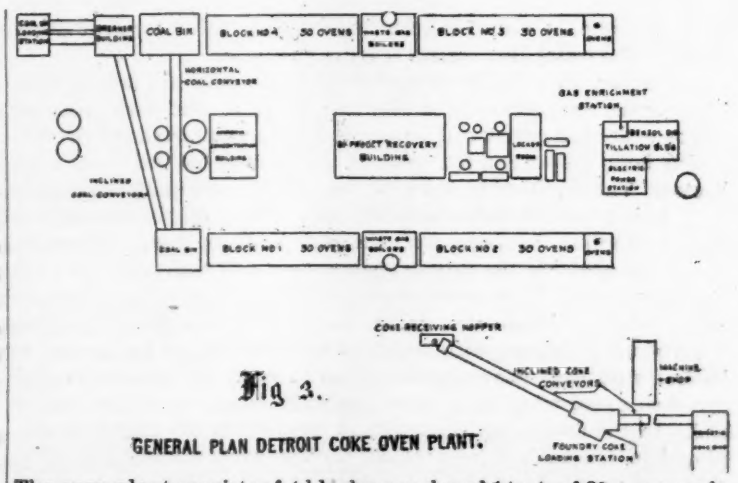


Fig 3.

GENERAL PLAN DETROIT COKE OVEN PLANT.

The oven plant consists of 4 blocks, numbered 1 to 4, of 30 ovens each a small block of 6 ovens, built as an extension of block No. 2, and another similar extension of 6 ovens at the end of block No. 3. The 60 ovens in blocks 3 and 4 were completed and went into service in March, 1904. These ovens were similar in design to those built previously, but were 5 feet longer. The heating flues were built of small Belgian brick, instead of the large tile used in the older ovens.

The demand for coke in the district supplied by Detroit has increased every year since the plant was built, with the single exception of 1908—the year following the panic. To increase the production of the plant to meet this constantly growing demand for coke has, therefore, been a constantly recurring problem. From 1904 to 1907 (inclusive) the problem was solved by decreasing the coking time nearly 4 hours; by this means coke production was increased about 16 per cent. To secure this result however, it was necessary to operate the ovens at as high a temperature as the refractory materials then employed would stand. A further increase in the production of coke could be secured only by building more ovens, or by rebuilding some of the existing ovens, increasing their size and using a higher grade of refractory material in their construction. After very careful consideration it was determined that the latter plan for increasing the capacity of the plant would be more profitable, although it involved the partial destruction of ovens which, after 7 years' service, were giving results superior to those obtained when first built, and which could undoubtedly be kept in operation for several years with comparatively small cost for repairs.

This method of increasing the capacity of the plant having been determined upon, between November, 1908, and May, 1909, block No. 1 was enlarged (a few ovens at a time, the rest of the block being kept in operation) by making the ovens higher; the covering was taken off above the oven chambers and the oven heating flues were removed. The division walls were then built higher and new heating flues were constructed of silica brick. These ovens were called "5-high" as they have 5 superimposed, horizontal heating flues in each side.

During the summer of 1910, block No. 2 was rebuilt and enlarged to 5 high. No change was made in the general design, but silica brick were used in the division walls and silica slabs in the oven heating flues. Block No. 3 has been rebuilt along the same lines during the past summer, and it is planned to rebuild block No. 4 during the summer of 1912.

In some places where large quantities of coke are consumed there is no market for gas; in other places, the demand for gas far exceeds the surplus which would be produced in making enough coke to supply the local market. Prices obtained for coke and gas and the cost of generating steam also vary greatly in different localities. In order to determine the type of oven best adapted for each of these varying conditions, the Semet-Solvay Company decided to build, at Detroit, several ovens of different types.

In August, 1909, 6 experimental ovens, built of silica material, and similar in all respects to the old standard type of Semet-Solvay oven, except that they are equipped with an improved and enlarged form of recuperator, were put into regular service. With these recuperators the air used for combustion in the oven heating flues is heated to a temperature of about 1,400° F., or about 600° higher than with the older and simpler form of recuperator. The better transfer of heat from the combustion gases to the air resulted in a decreased consumption of fuel gas per ton of coal carbonized; as the combustion gases leave the recuperators about 500° F. cooler than the combustion gases leaving the old style recuperators, their value for generating steam in the waste heat boilers is greatly reduced.

In October, 1909, 6 more experimental ovens were put into service. These ovens were arranged so that they could be fired with producer gas or with oven gas at will. Outside regenerators were provided in which both the air and the producer gas used to fire the ovens were heated. The results obtained with these ovens were quite unsatisfactory, owing mainly to leaks which early developed in the various flues connecting the ovens with the regenerators; it was, therefore, decided to abandon the outside regenerators and rearrange the oven heating system. Three ovens were rebuilt, equipped with individual regenerators, and were arranged to be fired with oven gas. Two ovens were rebuilt, equipped with improved recuperators, and arranged to be fired with oven gas or producer gas at will. The producers (one for each oven) were built below the oven chambers at the pusher end. In the design and operation of these ovens the principles employed in the Doherty economizer benches were successfully used; coke was used for fuel and the entire make of gas was available for sale. These two ovens are of special interest to the gas fraternity, as they were the first gas ovens[1] commercially operated in the United States.

The results of these 2 experiments were both quite satisfactory, but there were a number of details in which it was evident that with the experience gained in 5 months' operation, some improvement could be made. It was, therefore, decided, during the past summer, to rebuild these 6 ovens, equipping them with individual regenerators and arranging them to be fired with oven gas only, and to build 3 new ovens, to be fired with producer gas on the Doherty economizer system, or with oven gas at will. Construction work on these ovens is now under way.

The table below gives the results obtained per ton of dry coal coked, with various types of heating systems employed, when using coal averaging 26 per cent. volatile matter, the coking period in each case being 20 hours.

Results with Various Types of Semet-Solvay Ovens at Detroit.

Type number	1	2	3
Number flues high	4	5	5
Material—division walls	Fireclay	Fireclay	Silica
Material oven flues	Belgian tile	Silica	Silica
Air heated in	Sole flue	Sole flue	Sole flue
	Recuperators.	Recuperators.	Recuperators.
Fuel gas required—cu. ft	6,800	6,200	5,500
Fuel gas—B.T.U.'s per cu. ft.	525	517	505
Surplus gas—cu. ft	3,900	4,500	5,200
Surplus gas—B.T.U.'s per cu. ft.	610	610	610
Lbs. steam from waste heat	950	800	800
Type number	4	4	
Number flues high	5	5	
Material—division walls	Silica	Silica	
Material—oven flues	Silica	Silica	
Air heated in	Improved	Improved	
	Recuperaiors.	Recuperators.	
Fuel gas required—cu. ft	5,300	....	
Fuel gas—B.T.U.'s per cu. ft.	510	....	
Surplus gas—cu. ft	5,400	10,700	
Surplus gas—B.T.U.'s per cu. ft.	610	556	
Lbs. steam form waste heat.	400*	500*	
Lbs. coke required for oven fuel	...	235	

*Est mat d.

In the original installation each block of ovens was equipped with a double hydraulic main, having separate compartments for rich and lean gas. Duplicate gas condensing and washing systems were provided for the rich and lean gas. Each system consisted of 8 tubular condensers and 2 bubbling ammonia washers; a spare washer was provided which could be used for rich or lean gas at will. As the daily coke output of the plant was increased, it became necessary to enlarge the capacity of the gas condensing and washing apparatus. After a series of experiments with a Doherty washer-cooler, it was decided (1900) to replace the tubular condensers and the bubbling washers with this type of apparatus. Four single-compartment washer-coolers, each 8 feet in diameter, were installed to be used as condensers; 2 of these are used in series to cool the rich gas; the other two also in series, cool the lean gas. A 4-compartment washer-cooler, each section 8 feet square, which had been used in the preliminary experiment, was put into regular service as a final ammonia washer for rich gas. A 5 compartment apparatus, each compartment 7 ft. 6 ins. square, was installed as a final ammonia washer for the lean gas. Each set of apparatus has been found by actual test to be of ample capacity to handle 10,000,000 cubic feet of gas daily. The ground area occupied by the new condensing and washing plant is only ⅔ that required by the old apparatus of ¼ the present capacity. The gas condensing and washing systems are shown in diagram, Figs. 4 and 5.

Fig 4.

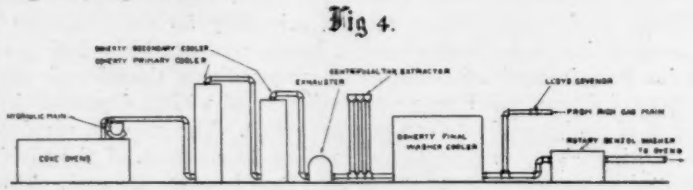


DIAGRAM OF FUEL GAS SYSTEM

Fig 5.

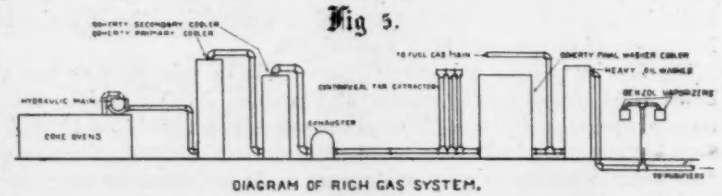


DIAGRAM OF RICH GAS SYSTEM.

When gas deliveries commenced the nitrogen content varied, from 3 per cent. to 12 per cent., and the calorific power varied as much as 75 B.T.U.'s per cubic foot. This difficulty was obviously due to leakage through the oven walls induced by variations in pressure.

1. By-product coke ovens so designed and operated that all of the gas distilled from the coal carbonized therein is available for sale.

It was, of course, owing to the permeability of refractory materials, impossible to absolutely prevent leakage through the oven walls if the pressure within the ovens or in the adjacent heating flues differed materially from the atmospheric pressure. To prevent leakage, therefore, it was necessary to devise a method which would automatically control the gas pressure in the ovens. Experimentally it was found that a satisfactory yield of gas, uniformly low in nitrogen—that is to say, below four per cent.—could be obtained from a block of coke ovens only when the variations of gas pressure in the hydraulic main were less than .03 of an inch water column. About 2 years was consumed in developing a practical governor capable of controlling the pressure variations within these narrow limits. During the 2 years the only practical method of avoiding leakage of air into the ovens, was to run with so high a mean pressure, that the pressures in the ovens were above atmospheric pressure, even when the pressure at the hydraulic main was lowest; as a result the loss of gas, due to leakage from the ovens, was excessive and the yield of surplus gas was materially reduced.

After successful pressure controlling mechanisms were devised and installed, it became a comparatively simple matter to control the calorific power of the gas. From the coal used at this plant, the gas produced during the coking process varies from about 700 B.T.U.'s per cubic foot, when an oven is freshly charged, to about 350 B.T.U.'s per cubic foot at the conclusion of the coking period. If all the surplus gas were the richest portion, it would average about 650 B.T.U.'s per cubic foot; as the gas from any oven may be delivered to the rich or lean gas systems at will, it is obviously a comparatively simple matter to so vary the separation as to deliver all the surplus gas at any required calorific power between 500 and 640 B.T.U.'s per cubic foot. In practice it is customary to vary the calorific power as the illuminating power is changed as given in the following table:

15-candle power gas			.....	605 B.T.U.'s.
16-	"	"	"	620 "
17-	"	"	"	635 "
18-	"	"	"	640 "

As no gasholder is used, calorific determinations made on the gas, as delivered direct from the plant, frequently vary as much as 20 B.T.U.'s from the standard, but the average of all determinations for a period of 12 hours is seldom more than 5 B.T.U.'s below, or more than 10 B.T.U.'s above the standard required.

In order to insure the control of the illuminating power of the gas delivered, so as to meet the requirements of the Gas Company, a water gas set was installed, and water gas was used for enriching until March, 1904, since which date benzol has been used for this purpose. Benzol enrichment proved quite satisfactory till the following winter; then trouble began. When the temperature dropped, illuminants condensed and the candle power was low; with a rising temperature, this condensate was taken up by the gas and the candle power was too high. This difficulty was reduced somewhat by the use of a higher grade of benzol during the winter months, but it was not entirely overcome until 1908, when apparatus was installed for washing the gas before enrichment, with an absorbing oil which removed practically all of the naphthaline and other condensable hydrocarbons. Since this apparatus has been in use there has been no appreciable difference between the candle powers observed immediately after enrichment and those observed at the Gas Company's station, about 2½ miles distant; and the enriching value of the benzol used has been as high in the winter months as during the summer.

At the Detroit plant the production of an exceptionally high grade foundry coke has always been considered of first importance. To secure this desired result it was early discovered that a better quality of foundry coke could be made from a mixture of coals—one of which is very low in volatile matter—than from any one coal coming into the Detroit market. The best foundry coke has been made from a coal mixture containing from 25 to 26 per cent. volatile matter; from such a coal the yield of gas and other volatile products is necessarily much lower than would be obtained from a good gas coal containing 32 to 34 per cent. volatile. Notwithstanding this handicap, the normal yield of gas per ton of dry coal, the nitrogen content in the gas not exceeding 4 per cent., varies from 10,400 to 10,800 cubic feet when coking in 20 hours. With higher heats and a shorter coking period the total make of gas is materially increased. No accurate determinations have been made of this increased make of gas due to higher oven temperatures, but the results obtained from the entire plant, when one block was operated for several weeks at 16-hour coking time, indicates that the yield of gas per ton of dry coal from this block approximated 11,500 cubic feet.

As the design and operation of by-product ovens have been improved, additional knowledge has been gained as to the kinds of coal best adapted for use in the manufacture of the various grades of coke desired in different industries; and much also has been learned of the effect of different rates of carbonization on the quality of coke. As a result of this increased knowledge, grades of coke specially adapted to various uses are now made, and the prejudice formerly existing in the iron industry against by-product coke has almost entirely disappeared.

The sale of crushed coke, mainly for use as domestic fuel, is increasing rapidly, as shown by the sales from the Detroit plant, which during the last 3 years were as follows:

Year.	Tons.
1908	42,797
1909	62,704
1910	106,385

Sales to date this year indicate that at least 150,000 tons of domestic coke will be delivered in 1911.

During the past decade all of the difficulties which tended to prevent the successful operation of a by-product oven gas plant, in a suitable location, have been satisfactorily overcome. In thermal efficiency and in total yield of gas the by-product oven compares favorably with the best gas benches. The development of the type of oven, which may be heated by burning producer gas or oven gas at will, provides a simple and satisfactory method of adjusting the daily make of gas to the demand without changing the rate of carbonization. Variations in the heating and illuminating power of oven gas may be controlled within very narrow limits; all doubt about the possibility of disposing of a greatly increased tonnage of by-product coke has been removed in great sections of the country by its general adoption for use as a metallurgical and domestic fuel.

The achievement of these results in the development of the by-product oven method of carbonizing coal makes possible, in the manufacture of coal gas on a large scale, those economies in construction and operation due to the use of large units, which have proven of such enormous value in the manufacture of iron and steel, in transportation by rail and water, in generating electric power and in digging the Panama Canal.

The paper having been read the Chairman of the Technical Committee suggested (and the President thought it an excellent idea) before discussing the Blauvelt paper the next two papers (one on "Operation of Verticals at Providence, R. I.," by Mr. Carroll Miller, the other a "Report on Verticals at Manchester, N. H.," by Mr. W. G. Africa), being so near akin in subject matter, speakers would naturally branch from one to the other. He, therefore, called for the reading of those papers, to facilitate joint discussion. Mr. Carroll Miller then read his paper on

OPERATION OF VERTICALS AT PROVIDENCE, R. I.

[For the text of the MILLER paper, see JOURNAL, Nov. 13, 1911; p. 364.]

Having finished the paper proper, Mr. Miller remarked: I might here add that I originally had in the table analyses of the coal for each month, but as some doubt was held about the methods of taking the samples, I omitted them. The coal we had been getting would average about: Moisture, 2 per cent.; volatile, 34 to 35; ash, 7 to 8; and the corresponding coke from a dry basis, 2½ to 4 per cent. volatile matter and 10 to 11 per cent. ash.

The President then introduced Mr. W. G. Africa, who presented the following matter on

VERTICAL RETORTS AT MANCHESTER, N. H.

[For the text of the AFRICA paper, see JOURNAL, Nov. 27, 1911; p. 343.]

Joint Discussion.

The President said the three extremely interesting papers were now before them for discussion.

Mr. Macbeth asked Mr. Miller and Mr. Africa whether the variations between the flat flame and the D burner were constant?

Mr. Fulweiler—There were several points in the paper on coke ovens of which he should like to speak. Early in the paper it is said the permeability of refractory material or large number of joints is essentially the cause of a rather excessive leakage in coke ovens? Under the ordinary condition in gas retorts the pores in the material itself, having been in use for some time, will tend to become filled with carbon, thus making them more or less gas tight, but with joints or cracks this action did not seem to take place so rapidly or so thoroughly. In their work on controlling variations of pressure in hydraulic main, did they find any trouble with vibrations which seemed to be set up by the action of the exhausters? The average of the gauge readings would show uniform conditions, but periodic vibrations seemed to cause considerable leakage, both of air and of

gas, in the retorts themselves. As to the question of benzol enrichment where gas was oil scrubbed, is it to be understood that, speaking from a standpoint of condensable vapors, the gas was practically dried before adding the benzol, so there would be no other condensable hydrocarbons present to complicate the action of the regular vapor tension laws. Speaking of rapid carbonization, Mr. Blauvelt did not express an opinion as to which direction this worked, and the speaker would ask him to express an opinion as to how their experiments resulted. In some cases it was understood that a very rapid carbonization tended to give a loose or friable coke, while further experiments led to quite the opposite result, depending apparently somewhat on the conditions rather than on the rate of carbonization. Mr. Blauvelt also spoke of a suitable location as apparently being an essential feature in the successful operation of by-product coke ovens; but was it not a fact that location in respect of a market for a very large quantity of coke was a pre-determining factor in the success of by-product coke oven plants, or does Mr. Blauvelt believe such market can be worked up under almost any condition? In the Africa-Miller papers, it was, of course, difficult to compare results if the coal used were not the same; yet they were probably of the same general type. It seemed probable that the apparently better results obtained by Mr. Africa might be due to the different methods of carbonization followed at these two plants, and which Mr. Africa very briefly touched upon when mentioning the existence of free space above the charge in the Manchester vertical retorts. In the ordinary horizontal retorts there existed a rather excessive, highly-heated free space above the charge at the top of retort, and it was also known that in some types of vertical retorts which were completely filled no free space existed, so they believed that the gas given off from coal was practically saturated with a mist of heavy hydrocarbons, and that some at least of this hydrocarbon mist, if properly handled, was capable of fixation into gases and vapors carried by the bulk of the gas formed from the coal. Perhaps the efficient fixation of this vapor might explain the difference in the results between the two systems. In the completely filled vertical retort no free space existed so there could be no secondary fixation of the tarry vapors, but in the Manchester system of vertical carbonization the free space could be regulated as to height and extent, and the temperature, too; furthermore, this free space was of considerable area, so the polymerization which taking place in the vapors was due, in large measure, to radiant rather than to conducted heat. The difference in the action was apparent when one considered that in a horizontal retort charged practically full there was also a small free space, but the gas in passing over the coal was brought into intimate contact with the top of the retort, so practically all the heating was done by conduction. Furthermore, in the horizontal retorts the free space was in the upper part of the retort, which was also the hottest portion because less heat was being withdrawn at that point and one could not modify or control this temperature, whereas in the vertical system with a free space the temperature could in the top section be almost anything one pleased, and could, as mentioned above, either enlarge or reduce the heated area. Comparing the analyses of the tars produced by the different systems of carbonization, correcting the observed gravity and coke for the effect of free carbon, it is found that the tars arrange themselves in the following series: Continuous verticals, ordinary verticals without free space, verticals with free space, chamber ovens arranged to produce illuminating gas, coke ovens, low temperature horizontal retorts and high temperature horizontal retorts. The corrected gravities rising steadily from 1.06 to 1.16, the free carbon rising from 3 to 35 per cent., the coke formed rising in about the same ratio, and the unsaponified material falling from 12 per cent. to a fraction of 1 per cent., all of which tended to show that more and more complex hydrocarbons were formed in the tar as the temperature of polymerization arose or came into existence, effected first by purely radiant heat, but in the end by purely conducted heat. It seemed, therefore, that one must use the proper mean position where there shall exist a certain definite amount of free space to effect polymerization, yet be able to regulate the temperature and effect it by purely radiant heat. With regard to the furnace fuel at Worcester, Mass., they seemed to use something approximating 19 per cent., and at Manchester only about 14 per cent., which seemed considerable difference, but when they considered that the two fuels apparently contain about the same fixed carbon and ash, it was undoubtedly effected by the rate of combustion per square foot of grate. At Providence they seemed to report about 14 to 16 pounds per square foot of grate, whereas at Manchester it was about 5 or 6 pounds.

Mr. Blauvelt—Mr. Miller gave them the coal handled per man per day, and he would like to inquire whether that was hand labor or what other item it included. At the bottom of one particular page, he would ask Mr. Africa how the labor on his verticals compared with the figure given by Mr. Miller.

Mr. A. E. Forstall—I noticed that Mr. Blauvelt, following recent scientific practice, gave results in terms of tons and pounds of dry coal. Being one of the old time gas men who has been accustomed to take the material as he found it and figure his results from that, he should like to know what would probably be the average percentage of moisture in coal as handled, so that he can check up the figures for dry coal as compared with the figures for coal as it ran. In another table he noticed that the total amount of gas made (divided between fuel and surplus) was constantly 10,700 feet per ton, which raised a doubt in the speaker's mind as to whether the fuel gas was metered, since it did not seem to him that, throughout the varying conditions which must have come with the changing of the furnace the yield of gas could have been exactly equal all the time. He would ask Mr. Blauvelt if the gas were metered. As to Mr. Miller's paper he could not quite understand why the coal sampler did not work, being under the impression that the coal was crushed before it was put into the storage bin for vertical retorts, and if it were crushed he thought the sampler should afford a pretty good sample. In the main table given by Mr. Africa the speaker was troubled at first to understand the meaning of the last line "Calorific value per pound," but after thinking it over, he presumed it means the calorific value of the gas produced per pound of coal carbonized. As to what Mr. Fulweiler said anent the difference between the effect of radiant heat and conducted or converted heat on the character of the gas produced, he thought it would pay the members of the Institute to go back through the volumes of the *Journal of Gas Lighting*, using as a guide the index published in the number for September 12, 1911, and read the lectures and papers presented to Associations in Great Britain by the late Mr. William Young, who had gone into that subject of the difference in the effect between radiant and conducted or convected heat very thoroughly. His experiments and deductions seemed to prove quite conclusively there was a selective action of radiant heat, by which it broke down the heavier hydrocarbons into lighter and permanently gaseous ones, and if one can properly proportion the amount of radiant heat to which the gas is subjected, after it leaves the coal and before it leaves the retort, one could get very much higher results than if we did not have this effect of radiant heat. It always seemed to him a strong point in favor of vertical retorts, that by experiment one got exactly the amount of free space, therefore, the amount of radiant heat which gave the best results for the kind of coal being used, and in the actual process of working gave that amount of free space very closely without going to any refinement. It was also possible to do this in a horizontal retort, but it was not as easy to get a like amount of space for each charge as in the vertical retort, where variations of a couple of inches in depth of charge would not make a great percentage difference.

Mr. Hartman said he noted in the Blauvelt paper that "The air is heated in the recuperators to a temperature of about 1,400°." This was undoubtedly good for reciprocator practice, but in the coke oven industry, as also in the steel and glass industries, regenerators are known to be much more efficient than recuperators, and a temperature of 2,000° for secondary air was not at all unusual in coke oven practice. They also seemed to have experimented on coke ovens with individual regenerators, but he failed to note any reference to that in the table of results. Further along he says they are going to build or were building more of this type, therefore, the results it must be inferred were promising. It would be interesting if the author gave them figures referring to individual generator settings. Regarding the Providence verticals, these results then are all given per ton of 2,240 lbs., and he figured the gas per ton of 2,000 pounds amounted to 9,880 cubic feet. It would be interesting to know something of the quality of coke from these verticals, and whether it was used in foundries as well as for domestic purposes. Carbon trouble seemed excessive at the Providence plant, the capacity being reduced over 8 per cent., and he noted sometimes the charges shrunk, probably due to the extreme bottom of the retort being too cold, but the speaker suspected it might be due to carbon. The pressure was given in the Providence retorts of from 10 to 12 inches of water during the first period of the charge and 3 to 4 inches during the last few hours. In that connection he would like to read a few pressures taken the other day on a by-product coke oven with a 13.6 ton charge of coal; the coking time was 18 hours and 45 minutes. The pressures 15 minutes after charging at the top were 25½ millimeters or about 1 inch; at the bottom 30 millimeters, 1½ minutes after charging, the pressure at the top was 2 $\frac{3}{10}$ths millimeters, at the bottom 3 millimeters. Four hours after charging the top pressure was 2 $\frac{3}{10}$ths millimeters, at the bottom 3 millimeters. Eighteen hours after charging the pressure at the top was 2 $\frac{3}{10}$ths millimeters, at the bottom 3 millimeters. Therefore, he did not understand why the pressure should be so high in bottom of a vertical retort. It must certainly interfere with the proper and scientific operation of a coal carbonizing system to have the difference of pressure so great in these spaces. At Providence the fuel was a selected fuel, it being 2 inch coke before being used. Regarding the Manchester plant it would be interesting to know something of the pressure in the retorts and the temperature outside of them, the temperature of the secondary air and the temperature of the stack gases. In the Manchester plant a number of changes were made in order to adapt the retorts to size and taper to the coal, which appeared a very serious point with the verticals. He had to adapt the retort to the coal else be restricted to the sort of coal to use. It is said, "The lower lids were leaking badly, but have now been changed, reducing the leakage to a point where it is of no consequence." He would consider any leak at all was of consequence. Again, the coal is a picked one; ¾-inch, screened from Farmington coal, the slack being all taken out. In fact, he understood that at this plant, having run out of lump coal, they were obliged to use slack and were seriously handicapped with carbon trouble. This Farmington coal was a very rich one. He had an analysis of Farmington slack, but not of the Farmington lump coal lines. The former with an ash content of 9½ per cent., had a volatile content of 36.8 per cent, the ammonia obtained from that slack coal by our direct process should be 27.8 lbs. sulphate. The furnace fuel was 13.27 per cent. which is also stated as combustible, free from ash and water, amounting to 11.77 per cent. It would be interesting to hear why in July the highest yields of gas and candle power were obtained. Coal weights were taken from shipping figures, but below it is stated adjustments were necessary to charge off discrepancies in coal stock. It would appear that shipping weights are not sufficiently authentic to use for published results. He would ask if there are any carbon troubles with the Manchester retorts; also

how the breeze was handled. With vertical retorts he understood there was a charge of 50 or 60 pounds of breeze dropped into the retort before the coal was charged. That went into the mouthpiece and when the charge was dropped that breeze mixed with tar was dropped out with the coke. He would like to know what means were taken to separate that breeze and tar from the coke so as not to deteriorate the quality of the latter.

Mr. H. L. Doherty said it was a very easy matter to discuss the results obtained in the various carbonizing systems without getting anywhere, because they talked of cubic feet of gas in one case, again of candle power and then of pounds of tar, but said nothing about what that tar contained. It was his belief that, instead of being a difference in the results secured, it was a difference in the division of the products; that is, in some cases what would go to our gas goes to our tar, so that one gets so many gallons of tar without showing its nature or how much it contains in the way of illuminants, so we have no basis on which to compare. This summer, when on his vacation, he attended the meeting of the British Institution of Gas Engineers. They had a very animated discussion in the convention hall and many more outside of it, and the bone of contention between the various debaters might have often been settled by a standard method of determining the results obtained by carbonization. While ordinarily the man who suggests a committee has to engineer it and do the work thereon, which he was unable to do, he thought the first thing the Institute should do was to appoint a committee to standardize methods of testing for carbonization, for if they did not so do they would never be able to reach a conclusion. For instance, Mr. Fulweiler called attention to the results obtained in candle power at Manchester, which were probably due to the polymerization of the products in the top of the retort, so that which ordinarily went to the tar in the form of illuminants was given to the gas instead. It was not only an ordinary distillation process or a fusing process, but also polymerizes it so that it would ordinarily be so heavy that it would be liquid and become gaseous at ordinary pressures and temperatures. He would call attention to one or two interesting things seen by him abroad. In one gas works where they were using outside generators (primarily to economize on labor) it would have been an easy matter for them to reduce the fuel cost to completely pay their labor bills. That is, they were spending more for furnace fuel than would have been necessary by the best practice to an extent equal to the full cost of this labor. The results secured in Europe under almost any system of carbonization to-day have brought the labor cost to a very low figure, so that the important item now was the fuel cost. On the other hand, the labor costs, as given in the various reports, were somewhat misleading. In one retort house visited one man apparently was doing all of the work in the manufacture of 750,000 cubic feet of gas. Outside were two men to take care of the coke coming from the retorts and two outside men were engaged in picking over the furnace fuel to recover the carbon. In trying to reduce their furnace difficulties by the using of a large amount of water and steam, the result was a large amount of fuel passed through without burning, and to recover that fuel they were picking it over. It was rather interesting to see two men picking over fuel from a retort house that was run by one man. Many of the high economies secured in Europe in every direction are secured, not as commercial economies, but as technical economies, while in America we strive more for commercial economy. He thought that nearly all of the reports made there, while intended to be strictly honest, were made on a basis that one was not safe in accepting, unless one investigated further, to make certain that he knew all of the conditions. When they talk about the efficiency, for instance, of heating apparatus, using gas for fuel, they take what is termed the net value of the gas; that is, they deduced the heat of condensation of the water, but you will often see them working with some sort of a system that used part of that heat of condensation, and yet they only charged off to their apparatus the net value of the gas. In other words, they work with a method that would be capable of giving them more apparent efficiency. He was really interested in the large production of gas which had apparently been secured in many coke oven processes from a very low volatile coke. As a ru e, they did not stop to compare the character of the coal, but they were in the habit of considering it only so many cubic feet per ton. Now, when one tried to make a calculation to indicate the yield he should get from a high or a low volatile coal, the yield gotten from the coke ovens full was really quite remarkable, which was one of the things to be taken up in the standardization of the methods of determining the results of carbonization. The fact was that much of the difference in results was due to the division of the products between the liquids and the gases; that is, between the gas and the tar. He would also call attention that it was not a very hard matter, by poor methods of scrubbing and condensing, to reduce the candle power as much sometimes as 2, 3 or 4 candles; and, in one particular case, not before their body for consideration, the poor results on candle power in a certain system were due entirely to the very poor system of scrubbing and condensing. The people exploiting that system apparently knowing nothing about scrubbing and condensing, were getting bad results in spite of the fact that they should get very good candle power gas from the method of carbonization. That which he wished to leave in mind is the necessity of standardization of the methods through which they state the results of carbonization work. [Applause.]

Captain McKay said, at Detroit 2½ years ago the ovens he saw were well filled and the coal was exactly level, and he did not doubt that a large part of the successful results there could be ascribed to the care with which the coal was put into the retorts. On the other hand, in the Manchester verticals one has 4 feet of heated retort purposely left unfilled with coal, in order to break up and fix the vapors, a marked difference in practice. He wished Mr. Blauvelt would state whether, above the line of the top of the coal in the coke oven, there was any heating flue in service giving additional heat to the gases after they passed through the coke and on their way to the take-off pipe. At Detroit the coal was crushed fine before being charged into the oven; on the other hand, in Manchester the lump coal gave good results, and when lumpy coal is broken fine in transit, the results fall off. The analysis of the coal, as to the volatile constituents, does not seem to give information that was comparative one time with another. Mr. Blauvelt might have some information as to the variation in the values, so far as gasmaking was concerned, of the volatile components of the coal when freely mined, and the value of the volatile components (showing the same percentage) from coal that had been in storage for several months. Would Mr. Blauvelt state how many B.T.U.'s he gave to a pound of coke, that they might see how many B.T.U.'s were used to coke a ton of coal, under the producer system? Also, in the same form the total B.T.U.'s in the gas fuel used per ton of coal coked. And whether he anticipated, with these further experiments, a substantial reduction in the total B.T.U.'s used to coke the coal? Would Mr. Blauvelt give them information as to differential pressures within and without the oven and flues at the different heights of the 6-high oven? Also, some information as to the temperatures that exist at the different levels of the 6-high ovens? Regarding this remarkable market for domestic coke in Detroit, he should like to ask, further, whether the great stimulus given to the sales of domestic coke was due to effective advertising, or to some salient feature in the preparation of the coke? In Boston they market probably a larger tonnage of coke for domestic purposes, and their present thought was that the care with which the coke was prepared for the domestic consumer was of prime importance. Was the Detroit metallurgical coke dense, or of open cellular structure?

The President said he disliked exceedingly to interrupt a very interesting discussion, but as they had a programme to complete, because Prof. Bone's lecture was set for the afternoon, he would ask the authors of these three papers to reply to what had been said, promising the Association if any time was left at the end of this session they would resume this discussion. He should like to hear from the authors of the papers now.

Mr. R. M. Searle asked what right the Institute had to ask a member to begin a useful work on an important subject and then to have it discontinued. It seemed to him wrong for them to send a large number of men to an annual meeting of this kind where a member read a paper unless they took time to discuss it, and took time to finish the subject. The subject before them was alone worth all that the convention costs. He thought it an outrage to leave it only half digested, and he protested.

The President said that between then and 12:30 they had a very carefully prepared paper by Mr. Bond, and another important report was that of the Calorimetry Committee; also, a very important report on "Thermal Value and Candle Power." Again the Committee on "Next Place of Meeting," that on the "President's Address," were to be heard from. If the Institute wished to cut out the latter half of that programme, as far as the President is concerned, they could not please him better. True the discussion was a most interesting one, but the rest of the programme could not be compressed into 10 minutes time, they could not interfere with Prof. Bone's lecture in the afternoon, and he did not think many of them wished to miss dinner. He should be very glad to hear a motion to the contrary, but unless such a motion was made he would request the authors of the papers to answer the questions asked, and then go on with the programme. If Mr. Searle preferred to move to the contrary he would, of course, put it. [Mr. Searle said he would so move, and the motion was seconded.]

Mr. Pratt proposed leaving the conduct of the meeting in the hands of the President, to which the President replied, that was not neccessary. In fact he was to have discussion from the floor, and he wanted every member to know that he could attack his conduct as Chairman without offending him personally. He then declared put the motion, "Shall we go on with the discussion and cut out the rest of the programme? Or shall we carry out our programme?" Those favoring the Searle motion, to continue this discussion, will signify the same by saying "Aye." Contrary, "No." The noes seem to have it. Does anyone ask for a division? [No response.] The noes have it and the authors of the papers will close the discussion.

Mr. Blauvelt—Answering the question, as to whether the leakage from retort ovens is due to the porosity of the material or to leaks at the joints, it may come from both causes. With a varying pressure on the retort, sometimes below and sometimes above the pressure in the oven heating flues, the leaks will not be stopped by deposited carbon. When heating our gas ovens before charging, we operated for a time with the gas in the heating flues above atmospheric pressure, and with an insufficient supply of oxygen for complete combustion in certain flues. On looking into the oven chamber a film of carbon monoxide flame was plainly visible covering the entire surface of these flues. As this flame was not particularly in evidence at the masonry joints, it was obvious that the gas leaked through the refractory material as well as through the joints. Now, with a uniform pressure-control, which kept the pressure in the oven slightly above the atmospheric pressure, after about 5 charges, all the leaks

(*Continued on page* 176.)

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[Official Notice.]

Annual Meeting, Illinois Gas Association.

Illinois Gas Association,
Temporary Office of Secretary,
Dixon, Ills., March 6, 1912.

To the Members, Illinois Gas Association: The next annual meeting of the Illinois Gas Association will be held in the Auditorium Hotel, Chicago, under dates of March 20th and 21st, 1912. Papers on these subjects are being prepared:

"Coke Breeze."
"Up-to-date Gas Lighting."
"An Illinois Gas Man's Impressions Abroad."
"Two Pounds Pressure at the Tip. Why Not?"
"High Pressure Distribution."
"Liquid Purification."
"Photometer Work."
"Study of a Water Gas Machine."
"Commercial Paper."

Word has been received that the banquet in connection with the meeting will be held the evening of March 20, in the "Florentine Room" of the Congress Hotel. Mr. John Parker, Western Sales Manager of the Eclipse Stove Company, is to be our toastmaster. An excellent banquet has been arranged for and very able speakers, of local and national reputation, will be on hand. As to the vaudeville entertainment following the banquet, this matter has also received careful study, and from all assurances there will be no lack of excellent talent. It cannot be too strongly impressed upon the members that their attendance at this convention is of the utmost importance. The excellent papers listed cannot help but be of interest, and the authors should be rewarded by a good discussion of their presentations. Wherefore, lay all matters aside and plan to spend the 20th and 21st in Chicago, thus making of these two days ones long to be remembered.

F. E. Newberry, Secretary.

[Official Notice.]

Fourth Meeting of the Pennsylvania Gas Association.

Pennsylvania Gas Association,
Office of the Secretary,
West Chester, Pa., Feb. 21, 1912.

To the Members, Pennsylvania Gas Association—Gentlemen: The fourth meeting of the Pennsylvania Gas Association will be held in Williamsport, Pa., the 10th, 11th and 12th days of April. Indications are that it will prove successful and interesting, possibly more so than any other preceding one. Let us work to that end. Any communications addressed to the Secretary, care the Chester County Gas Company, of West Chester, Pa., will receive prompt attention.

Yours truly, W. O. Lamson, Jr., Secretary.

[Official Notice.]

Fourth Meeting, Southern Gas Association.

Office of the Secretary,
Southern Gas Association,
Atlanta, Ga., Feb. 19, 1912.

Gentlemen: The Fourth Annual Meeting of the Southern Gas Association will be held in Jacksonville, Fla., April 17, 18 and 19, 1912. The following papers are promised:

"Further Notes on Public Policy," by Mr. R. C. Congdon, Atlanta, Ga.
"Better Domestic Appliances," by Mr. C. A. Case, Cleveland, O.
"Scientific Salesmanship as Applied to the Gas Industry," by Mr. Albert B. Kelley, Philadelphia, Pa.
"Gas Lighting in the South," by Mr. H. P. Dains, Philadelphia, Pa.
"A Practical Demonstration," by Mrs. S. R. Dull, Atlanta, Ga.
"Practical Experiences in the Gas Business," by Mr. Roscoe Nettles, Tampa, Fla.
"The Influence of Various Departments on Commercial Work," by Mr. Chas. D. Armstrong, New Orleans, La.
"System in Office Management," by Mr. L. N. Young, Athens, Ga.
"A Study in Retort House Practice," by Mr. S. H. DeFreese, Chattanooga, Tenn.

Hotel and railroad rates will be announced later.

E. D. Brewer, Secretary.

BRIEFLY TOLD.

March Meeting, New York Section, Illuminating Engineering Society.—The regular monthly meeting of the New York Section, Illuminating Engineering Society, will be held March 14th, at 8 P.M., in the United Engineering Societies' Building. The subject of the evening will be "Color Photography," and Dr. H. E. Ives is down for a paper on the "Relation Between Photography and Photometry." The Kinemacolor Company has also arranged to give a "lecture and demonstration" of motion pictures in color, which promise to be well worth viewing. The meeting proper will be preceded by an informal dinner, *a la carte*, at Keene's Chop House, 70 West 36th street, at 6 P.M. Secretary Marshall desires us to say that ladies will be welcome to share in the dinner and to assist at the meeting.

March Meeting, Philadelphia Section, Illuminating Engineering Society.—Secretary Eichengreen informs us that the March meeting of the Philadelphia Section, Illuminating Engineering Society, will be held in the Assembly Room, 1000 Chestnut street, on Friday, March 15th. The third "15-Minute Talk," on the "Essential Principles of Illumination" (concerning shades and redistribution of light) by Prof. A. J. Rowland, of the Drexel Institute, will be the first topic considered. It will be well demonstrated by simple experiments, and should hold the attention of the large audience expected. The same may be said of the papers on the "Application of Photography to Photometric Problems," by Dr. Herbert E. Ives, of Cleveland, O.; and on "Casual Observances of European Lighting," by Dr. C. H. Sharp, of New York. Both will be capably illustrated by means of lantern slides, and a particularly interesting feature is an exhibition of the representatives types of lamps and their candle power distribution. The regular dinner (held as usual in Mosebach's restaurant) will be in no sense neglected.

March Meeting, "Gas Meeters."—The "Gas Meeters" are informed that their March meeting will be held the 18th inst., at 4 P.M., in the showrooms of the Public Service Gas Company, Broad and Bank streets, Newark, N. J. There will be an inspection of this model building, under the guidance of Mr. W. H. Pettes, Chairman of the Reception Committee, after which there will be a review of a special installation of indirect lighting, accompanied by a short lecture on the subject by Mr. R. F. Pierce. Dinner will be served at 6 P.M., in the Hotel Achtel-Stetter, 842 Broad Street, Newark, at the usual price of $2 per plate. Those who desire to attend are requested to communicate with the Secretary, H. Thurston Owens, 42 Pine street, New York.

QUARTERLY MEETING, EMPIRE STATE GAS AND ELECTRIC ASSOCIATION.—The regular quarterly meeting of the Empire State Gas and Electric Association was held at Poughkeepsie, March 6th. The sessions were opened shortly before 11 A.M., in Masonic Hall, with Mr. H. W. Peck, of Schenectady, Chairman of the Committee on Local Meetings, presiding, with Secretary Chapin recording. The 75 members in attendance were welcomed by Mayor John K. Sague, whose remarks included many pithy statements regarding public service regulation. The meeting was generally devoted to a discussion of the many and varying phases of the "New Business Section" of gas and electric enterprises. The debating was sustained through the presentation of selected topics, each being introduced by separate speakers. Those taken up at the morning session were' 'Advertising," "Co-operation" and "Wiring and Piping Old Houses." At 1:30 the members partook of luncheon at the Morgan House, and, on returning to the meeting place, the more serious side of the sessions was resumed. In the afternoon sitting the matters discussed included these: "Solicitors' Meetings," "Methods of Paying Solicitors," "General Publicity Work," "Appliance Bargain Sales," and "Wrinkles." The marked freedom of speech which has characterized this successful organization under the able guidance of Secretary Chapin was much in evidence. Among those prominent in the discussions were Messrs. J. C. MacSweeney, A. D. Dudley, M. S. Seelman, L. R. Sherck, C. W. Bennett, Frank Hellen and J. C. Parker. The meeting adjourned at 5:30 P.M., and later on 25 delegates were entertained at an enjoyable dinner served in the Nelson House, the host, Mr. T. R. Beal, Vice-President, Central Hudson Gas and Electric Company, being represented by Mr. H. N. Bugler and Mr. L. H. Sherck, Managers of the operating and commercial divisions of the Company. The guests of honor were Mayor Sague and Judge Spratt. Afterwards the visitors made an inspection of the notably profuse system of public street lighting (mainly of the electric type) which is maintained in Poughkeepsie, greatly to the gratification of the taxpayers and property owners in the biggest place in Dutchess county.

THE BOSTON PETITION FOR AN EIGHT-HOUR DAY.—It is an open secret that the labor agitators of Boston have been endeavoring for some time to induce the men of the Boston Consolidated Gas Company to "unionize." But so far the impression made in support of the scheme has been of the slightest sort. "Walking delegates, National Organizers," etc., have for months been trying to get at the officers and the men. The former have refused to see them or even to reply to their communications. When a committee of employees (as such) presented a petition for an 8-hour day, the Company informed them that it was considering a reduction in the hours of labor in certain departments, and hoped to be able to change the schedule by July 1st. Tha men accepted the situation, apparently, but the union immediately rushed into print in an attempt to persuade the men to demand immediate action, and the Company rests in appropriate silence over the new onslaught, quietly going on in its attempt to perfect a satisactory schedule early in the summer. There the matter stands. Probably this letter, sent to the workers the morning of the 4th inst., will prove an interesting sequel to the above mention:

OFFICES, BOSTON CONSOLIDATED GAS COMPANY,
24 West Street, Boston, Mass..
March 4, 1912.

Dear Sir: We take this opportunity to thank and commend all who have co-operated in the arduous work occasioned by the long and severe winter. We wish to assure you as a profit sharer, represented on the Board of Directors, that there has been no change in the attitude of the Company towards its employees, and that all matters concerning their welfare will have the same careful consideration which has been granted in the past. This assurance seems to be called for at the present time, in view of the mis-statements set forth in print, and by individuals not connected with the Company, who claim to represent the employees.—Yours very truly, Boston Consolidated Gas Company, by J. L. RICHARDS, President.

THE CENTENARY OF THE INTRODUCTION OF GAS AS AN ILLUMINANT.—There has been and there actually is not a little contention as to the exact year in which it could be positively asserted that gas for the purpose of public and domestic use became a figure in active commerce. Althoug the date discrepancies are really confined to a period of 9 years, it is nevertheless positively known that, in London, England, April 30, 1812, a charter was granted to "The Gas Light and Coke Company" by Parliament, and that this Company was the first one chartered in any country "to supply or furnish gas service to the public." It is also matter of absolute record that, early in the year 1812, David Mellville built, on his premises, in Newport, R. I., the first gas plant for operation in America. Under the circumstances, and to properly commemorate the event, which has been, is, and will continue to be, one of those which led to the incalculable bettering of the everyday life of mankind, it is proposed to fittingly hold a centennial celebration in respect thereto. The matter has been taken up by these four representative bodies:

The American Philosophical Society,
The Franklin Institute,
The American Chemical Society, and
The American Gas Institute.

And after many meetings and deep consideration the representatives of the aforesaid bodies have arranged for such celebration the following

Programme.—Thursday, April 18th, 1912, Hall of the Franklin Institute, Philadelphia, Pa., 8 P.M.:

"By-Products in Gas Manufacture," by Chas. E. Munroe, Ph.D., Washington, D. C., Prof. Chemistry, the George Washington University.

Programme.—Friday, April 19th, 1912, same place, 10 A.M.:

"The Commercial and Financial Aspects of the Gas Industry," by Hon George B. Cortleyou, President, New York Consolidated Gas Company.

Programme.—Same date, 11 A.M.:

"The Technic of Gas Manufacture," by A. E. Forstall, M.E., Secretary, Trustees Gas Education Fund, Am. Gas Inst.

Programme.—Same date, 2 P.M.:

"Gas as an Illuminant," by Van Rensselaer Lansingh, B.S., President, Illuminating Engineering Society.

Programme.—Same date, 3 P.M.:

"The Use of Gas for Heat and Power: The Testing of Gas," by E. B. Rosa, Ph.D., Chief Physicist, National Bureau Standards, Washington, D. C.

This circular letter from the Committee in Charge concludes with these paragraphs:

"These lectures will constitute an interesting and valuable review of the development of the use of gas as an illuminant and as a source of heat and power. Persons interested in the manufacture and use of gas from all parts of the country, members of the Societies named, and the general public (including ladies) are cordially invited to attend the sessions.

"An effort will be made to bring together as many as possible of the pioneers in the gas industry, those having been engaged in the industry 30 years or more. All such are requested to send their names to the Acting Secretary.

"A temporary LOAN EXHIBITION will be held in the Hall of the Franklin Institute, of articles, models, appliances, books or pictures, that have an historical interest. Anyone who knows of such articles should communicate at once with the Acting Secretary, Mr. William J. Serrill, 1401 Arch street, Philadelphia."

CURRENT MENTION—

"THE annual banquet of the Frankford Section, employees of the United Gas Improvement Company, Philadelphia, Pa., was held in Donahue's Hall, Frankford avenue, the evening of Friday, the 1st inst. The dinner and the after proceedings were enjoyably shared by 40 or more of the men; and Mr. D. Audley Reuben was far from being a 'rube' in his capacity as Toastmaster. In fact, he was quite to the condiment.—F. R."

THE Baltimore Consolidated Gas and Electric Company has given the requisite 30 days' notice respecting the resolution to retire $500,000 of its collateral trust 5 per cent. notes, the redemption date being fixed for the 1st prox. The price is par and interest (101¼), and the Continental Trust Company has charge of the distribution.

MR. W. F. HART, for years the capable and successful General Superintendent and Purchasing Agent of the Washington (D. C.) Gas Light Company, has resigned. The Chicago gentleman now at the head of the Company's affairs does not seem to have much use for Mr. McLean's men.

(*Continued from p.* 173.)

both through the material itself and through the joints are closed. In order to secure this result it is important there should be a nearly perfect control of the gas pressure within the ovens. To be fortified on this point I have brought with me several charts [indicating] showing that the variation of pressure on the hydraulic mains was only about ½ a millimeter of kerosene. This enable us to get a gas of remarkable uniformity, low in nitrogen and CO_2. I have with me a table containing all the gas analyses made in December, 1910; most of the samples were taken at the stations of the Detroit City Gas Company:

Enriched Gas Analyses, December, 1910.

Date.	Place.	C_6H_6.	CO_2.	C_2H_4.	O_2.	CO.	H_2.	CH_4.	N. by Diff.
1	Delray....	1.4	1.1	3.3	.7	4.2	50.6	35.0	3.7
1	Delray....	1.7	1.2	3.0	.9	4.7	50.2	34.7	3.6
8	Ovens.....	1.5	1.6	3.7	.6	4.6	50.2	35.9	1.9
8	Delray....	1.7	1.8	3.9	.4	4.4	49.0	35.8	3.0
8	Ovens.....	1.5	1.7	3.5	.6	4.6	47.7	37.4	3.0
8	Delray ...	1.5	1.8	3.8	.5	4.6	49.1	35.0	3.7
21	Sta. A....	1.2	1.4	4.0	.9	4.6	49.6	35.0	3.3
21	Sta. A....	1.4	1.5	3.8	.7	4.5	50.6	34.5	3.0
21	Delray....	1.5	1.5	3.9	.8	4.5	49.8	35.8	2.2
21	Delray....	1.3	1.5	3.8	.5	4.7	50.0	35.3	2.9
29	Delray...	1.2	1.5	3.8	.8	4.4	50.7	34.7	2.9
29	Delray....	1.2	1.9	3.4	.8	4.7	56.6	35.6	2.0
29	Sta. A....	1.2	1.5	3.5	.9	4.5	50 8	33.2	4.4
29	Sta. A ...	1.2	1.6	3.4	.9	4.6	48.9	35.0	3.8

Fuel Gas Analyses, December, 1910.

1	Ovens. ...	0.2	1.3	2.0	.5	4.8	50.7	38.1	2.4
8	Ovens.....	0.2	1.2	2.2	.3	4.5	55.6	31.2	4.8
22	Ovens.....	0.2	1.2	2.7	.6	4.7	57.3	29.4	3.9

To illustrate the reliability of the control of the calorific power of the gas as a result of the uniform hydraulic main pressure combined with the method of gas separation employed, and also to illustrate the satisfactory results obtained with benzol enrichment during the winter I will, with your permission, present a table showing the record of tests to determine the calorific value and the illuminating power of the gas delivered December 16th to 31st, 1910. In explanation of this table I would say that the gas is purified at Delray Station about ½ mile from the ovens; Station A is about 2 miles from Delray Station.

Log of Gas Operation, December 16th–31st, 1910.

Date. Dec.	B.T.U.'s per Cubic Feet		Candle Power				
	Req'd.	Del'd.	Avge. Delray.	Avge. Req'd.	Line Tests, Station A.	Delray	Sample Holders, Station A.
16	640	646	18.35	18.00	18.90	18.93	18.81
17	640	651	18.18	18.00	no test	18.38	18 86
18	640	647	18.23	18.00	19.17	18.40	19.18
19	633	639	17.14	16.87	17.55	17.38	17.57
20	607	624	15.22	15.17	16.38	16.10	16.08
21	619	626	15.56	15 94	16.14	15.93	16 40
22	612	618	15.52	15.50	15.89	15.68	15.96
23	606	618	15.13	15.08	16.07	15.26	15.81
24	605	617	14.93	15.00	16.05	16.58	16.19
25	605	611	15.14	15.00	15.52	15.60	14.76
26	614	616	14.71	15.58	17.47	15.12	14.94
27	605	603	14.13	14.12	15.55	14.38	13.71
28	611	620	14.95	14.75	15.04	15.55	15.37
29	607	615	14.87	15.12	14.65	15.20	14.51
30	634	632	17.06	17.17	17.64	17.24	16.82
31	640	644	18.63	18.71	18.71	18.62	19.17

One of the questions asked indicated that the questioner thought that we use a bubbling hydraulic main. With a bubbling main we found it impossible to secure the desired pressure control. With regard to the washing of the gas to remove the condensable hydrocarbons, I should have stated more clearly that those hydrocarbon vapors which are condensable under the most severe conditions of temperature and pressure to which the gas is to be subjected are removed. The loss of candle power due to the oil washer is generally less than 1 candle, and is caused largely by the elimination of naphthaline, toluol and xylol. As benzolized oil is used in this washer comparatively little benzene is absorbed from the gas. The table of results obtained last December, when cold weather prevailed much of the time, shows that there was practically no loss in candle power between our works and the station of the Detroit City Gas Company. I may add that the line through which the gas is delivered (formerly a natural gas main), is laid very near the top or surface so that the gas is sometimes cooled to below 32° F. in cold weather when there is no snow on the ground. With regard to the rate of carbonization, as affecting the quality of the coke, I do not wish to be understood as speaking with final authority on this point; but the results with the coal which we have used at Detroit indicate that different rates of carbonization are required according to the use to whlch the coke is to be put. Foundry coke requirements are that the coke shall be relatively dense, that the pieces shall be large and blocky. To get that result with certain kinds of coals, carbonization must proceed at a relatively low temperature, as compared with the temperature which experience on the same coals indicates gives the best furnace coke. With blast furnace coke it is better to have smaller pieces of a uniform size and of a well developed cell structure, with thick heavy walls, so that the smaller pieces into which the coke breaks are mechanically strong. These results are obtained best when the coke is made at a very high temperature. In making foundry coke we have secured the best results with temperatures which will give a coke, with the volatile matter below 1½ per cent. when coking at the rate of 20 hours in a 16½-inch wide oven. When making furnace coke I am of the opinion that the best results are obtained when coking in a much shorter time, probably 15½ to 16 hours in an oven of the same width. With the regenerator ovens which we operated similar to those that we expect to get into operation in a few weeks, we were able to coke without any difficulty in 14½ hours. The ceke so made, however, was relatively small and would have been absolutely unfitted for foundry coke requirements. The question of a suitable location of a coke oven plant has come up, also the question in regard to whether a market has been obtained by advertising or by preparation, by saying distinctly, by preparation. When the Detroit plant was built the Gas Company was a very large advertiser of coke for domestic fuel. A tremendous increase in the production of coke in the Detroit district has resulted in the elimination of advertising expenses for the sale of domestic coke both by the Detroit City Gas Company and by ourselves. Coke in former years was an unfortunate residual which had to be moved at the prices it would bring. At certain seasons there were enormous stocks and a strenuous campaign of advertising and selling was necessary; then, in January or February, when people wished to re-order coke, there was none to be had, and the next fall the same campaign had to be repeated. As a result, coke sold at a price far below its true value as compared with anthracite. Advertising expenses were heavy; new customers had to be obtained every year. Now, since through the whole district coke can always be purchased, one satisfied customer will say to his neighbor, "I saved $20 in my fuel bill last year by the use of coke," and the good work spreads itself. It is quite important, however, to have the coke very well prepared. At the present time we are following a practice of rescreening the coke from the bins. The amount of fine stuff removed is very small, but as coke is handled there is a tendency for the breeze to get into one place in the pile. The result is that the customer who gets the leavings of the pile gets a large percentage of breeze and is dissatisfied. The removal of 500 pounds of breeze from a 30-ton car of coke makes all the difference in the world in the satisfaction of a customer. With regard to the question of the effect of the gas being exposed to a high temperature, after it has come off from a retort, there is a difference in practice which is based on sound reasoning. The horizontal flue retort-oven possesses very certain distinct advantages for controlling the secondary reactions which take place. Captain McKay asked about the relative levels of the top of the heating flue and the top of the charges. By the ordinary method of charging and leveling a retort oven the level of the charge on top is always at a fixed elevation, depending upon the location of the leveling ram. With the horizontal flue oven it is possible to have the top flue at any temperature that may be required. It is also possible, in the design, to vary the location of the top horizontal flue, relative to the level of the top of the charge of coal, as may be desired according to the quality of coke that is to be made at the particular plant. In England and on the Continent the plan is generally followed by leveling the charge of coal at an elevation from 6 to 10 inches above the top of the top flue, so that the carbonization of the coal in the top of the oven is carried on very largely by the heat which ascends from the lower and hotter portions of the oven. In the manufacture of foundry coke this is probably a distinct advantage because the top portion of the charge of coke is rejected in loading foundry coke. The low top temperatures increase the yield of ammonia very materially, making a difference of as much as 2½ pounds of sulphate per ton of dry coal in the yield. Also, naphthaline trouble are unknown where those low temperatures prevail. Benzol yields are high and the tar is lower in free carbon. In making blast furnace coke, however, where the entire charge of coke is delivered to the furnace, it is important that every portion of the charge of coke as it comes from the oven should be almost exactly of the same temperature, indicating that the carbonization process has proceeded at a uniform rate from the walls to the center, and that the cell structure developed in the top of the charge shall be as near as possible the same as the cell structure developed lower down; consequently, in a plant designed primarily for the manufacture of furnace coke, it is I believe the best practice with the horizontal flue oven to have the charge of coal leveled at a point not more than 1 or 2 inches above the top of the top heating flue. It is also important to carry temperatures in the top flue practically the same as the temperatures in the other heating flues. With regard to the question of moisture in the coal. On a year's operation the moisture in the coal as received at Detroit varies between the limits of 3 and 4 per cent. The average is approximately 3½ per cent. As to the determination of the total quantity of fuel gas, I will say we measure the gas that goes to each individual block of ovens with Venturi meters. These have been checked by setting them up in series with the station meters belonging to the Detroit City gas Company. We have found that the difference between the amount of gas as calculated from the Venturi meters, compared with the amount recorded on the station meters on different tests, to vary from $\frac{14}{100}$ of 1 per cent. to $\frac{85}{100}$ of 1 per cent. I am not quite sure which is the more accurate. [Laughter.] It was noted by someone that the total gas given in the table in my paper was the same with all the different types of ovens. That was done purposely. I believe that all of our experience leads us to the conclusion that, with the same coal and with the same coking time, it does not make any difference which type of oven we used. These results were the average results obtained from several months' operation. From day to day the results varied considerably, the

total gas varying from about 10,400 up to 11,300 cubic feet per net ton of 2,000 pounds of dry coal. That difference is due almost entirely to the quality of coal charged. There is a great difference in the yield of gas and the other by-products, as to whether the coal is freshly mined or whether it has been in stock. It is my impression that with our coal the per cent. of volatile increases for a short time after the coals are put into stock. This increase is probably due to partial oxidation. Hence the total yield of gas is always less in stock pile coal than in coal which has come direct from the mine. I wish to indorse most heartily Mr. Doherty's suggestion that a standard method of standardization tests should be furnished by a committee of the Gas Institute. If this were done it would simplify these discussions, and it would not be necessary to take up so much time describing what the figures reported in these papers mean. With regard to the question of recuperation *vs.* regeneration. We are not prepared to give out any figures on the results with our regenerator ovens. I think the gentleman who spoke of that probably drew a correct conclusion when he called attention to the fact that we were building additional ovens of that type. I am sure, however, the use of recuperators *vs.* regenerators is purely a local question. The difference in the amount of surplus gas that will be available due to getting say 600° C. higher temperature for the air used for combustion with the use of regenerators is offset by the loss of steam that can be generated by the waste gas boilers. It is purely a question of the value of that gas which could be saved, as compared with the value of the steam which could otherwise be generated. In practice it is possible to get approximately the same thermal efficiency from the combined unit, boiler and oven, using recuperators, or ovens alone using regenerators. I am unable to answer all of Captain McKay's questions off-hand with regard to the differential pressures in the flues and in the ovens. In the ovens we aim to run with a pressure just above the atmosphere, say from ½ millimeter to 1 millimeter above the atmosphere; in the flues depending upon the method of operation there may be a difference from the top flue to the flue next to the chimneys of 10 or 12 millimeters of kerosene. In comparing the results by different methods of carbonization, it is I think very important, if any test is standardized, the volatile matter in the coal should be standardized. We all know there are certain coals that carry 35 per cent. volatile matter from which the yield of gas will be less than from other coals that are only 25 per cent. volatile. There is one thing quite readily appreciated when it comes to a comparison of the labor costs; the large unit is a great advantage over the small one. I was comparing results recently with a friend who has charge of another plant where the ovens are practically twice the size of the ovens at Detroit. We found that our operating unit crew was almost exactly half the number of men employed at the other plant. So far as we are able to see the number of men making up an operating crew would not be increased in any particular if the oven capacity were doubled. Notwithstanding the fact that our plant employed only about 55 per cent. as many men in the operating crew, the other plant had a little lower labor charge per ton of coal due to the larger size of the ovens. Therefore, it seems unquestioned that, in comparison with other forms of retorts of smaller size, the large retort oven has an advantage which can hardly be overcome.

Mr. Miller said the difference in candle power between the flat flame and the argand was practically constant for a fixed candle power in a flat flame, but the higher the candle power the nearer the flat flame and the argand approached. He thought there was no doubt that the empty space in the top of the retort increased the yield of gas. Their retorts were filled to within 6 inches of the mouthpiece. It was indicated that the yield was larger in Mr. Africa's case by the smaller yield of tar, the speaker's yield being a great deal higher than Mr. Africa's. He would ask Mr. Africa what were his average yields of tar and ammonia for these months for which he had given the results He only gave those figures for the test. The amount of coke per 100 pounds of coal carbonized used in a producer was usually higher in the case of a small grate area and shallow fire than when a large grate and deep fire were used, for instance, in Worcester, only about 6 pounds per hour per square foot was burned. He would ask Mr. Africa how much he burned and as to the size of the grate as well as the depth of the fire, and the same from Mr. Blauvelt. The number of Providence men was 10 altogether, 5 on each shift, and these charged and discharged the retorts and closed the fires. The coal contains a good deal of slack and was evenly crushed, so that the largest lump was 2½ inches. The reason that that method of making the sampling would give a smaller proportion of lumps in the sample was that when the edges of the chute that put the coal into the bins approached the hopper the large lumps did not get into the latter. They sold a good deal of coke for use in cupolas, and never found that the sticking in the retort was due to any accumulation of carbon; in fact, just after the retort was scurfed the charge very often stuck worse than before. Would Mr. Africa please tell him the length of time the coal staid in the retort? A good many other questions were asked in regard to breeze in the bottom of the retorts, etc., and he did not remember whether they were asked of him or of Mr. Africa, but as possibly Mr. Africa could talk a little bit faster than the speaker could, so to save time he would ask him to do the answering.

Mr. Africa said Mr. Miller answered the question about the difference in the standard burner. In regard to the amount of coal handled per man per day, as they had erected only 2 benches, they did not put in mechanical appliances for handling coal, hence their coal handling per man per day was not quite so much as at Providence. As to quality of the coke, at a branch of the American Locomotive Works located at Manchester, they had examined the coke and wanted to use it in their furnaces, but thus far this Company had such a demand for domestic coke that they have been unable to supply the locomotive concern. The coal used in the test was ¾-screened coal, screened at the mine and shipped all rail. The ordinary coal was ¾-screened coal at the mines and shipped by rail to tide water, loaded on vessel and unloaded from the vessel into cars at Portsmouth, then dumped from the cars into their sheds, which broke it as fine as run of mine coal. The 3 month's test was with the better quality of coal. They had one particular trouble with the carbon; that is, not more than one would have with ordinary horizontal retorts. The quantity of breeze used in each retort was from ½ to ¾ bushel, 40 to 50 pounds, which when mixed with the coke, crushed and screened, did not injure the quality of the coke. The length of charge was 9 hours. Mr. Miller suggested they did not give the tar and ammonia on the several months' tests. As they had some settings of horizontals, and it was necessary at times to run both jointly, it was difficult to keep the tar and ammonia separate during a period of several months, but were able to do it for several weeks during the test, as the horizontal benches were shut down. If he had overlooked any questions, he would ask Mr. Fulweiler to answer them, for he had charge of the tests recorded on page 2 of the paper.

Mr. Fulweiler said regarding the temperature in the benches, it was very much the same as that recorded by Mr. Miller, possibly a little bit lower. In the combustion chamber the temperature ran around 2,500° F., and the temperature at the retorts was about 2,200° F. At the top where the waste gas went into the recuperator, it is about 1,600° F. The actual temperature of the entering secondary air was somewhat higher; that ran about 1,800° F., due to the fact they were taking their air down again to admit it to the auxiliary combustion chamber, and in passing down it took up some little heat from the main combustion chamber. As to the pressure in the retorts, he did not see that 3 inches water pressure was a serious matter as affecting the carbonization of the coal, which was due to the fact that in the vertical retort they had a high column of coal and a small periphery, so that the area for the escape of gas decreased very rapidly. When first charged there was no excessive amount of pressure. Their tar had a gravity about 1 124, and about 8 1/2 per cent. of free carbon; that gave a corrected gravity for the pure hydrocarbons of about 1.087. The corrected coke would be about 30 per cent. of the tar. The twice dephlegmated distillate up to 170° in the tar showed 1.4 per cent., and its gravity was .87—approximately that of benzol. Their Manchester grate had about 22.5 square feet of surface, and they burned from 5 to 6 pounds of fuel per square foot of grate surface per hour.

The President said the Chair would announce one ruling from which he felt sure there be no dissent. It was that the authors who prepared the papers had earned the hearty thanks of this Institute, which were hereby tendered.

(To be Continued.)

[Continued from Page 162.]

PROCEEDINGS, FOURTH ANNUAL MEETING, INDIANA GAS ASSOCIATION.

Held in the Claypool Hotel, Indianapolis, Ind., January 17 and 18, 1912.

Second Day—Afternoon Session.

Discussion on the McKee Paper.

The President said they had listened to a paper that, in the opinion of your Executive Committee, would prove very valuable, not only to the members of that Association, but to the gas fraternity over the entire country. Industrial business was something comparatively new with them, but there was a wide field with wonderful possibilities. In fact there was not a city so small, but that this business could be worked up with great advantage. He was sorry that Mr. McKee was unavoidably absent, which prevented oral replies to questions asked, but he would be very glad to hear from anyone.

Mr. Graf—Those in the larger cities feel that a good part of their future business was in the industrial field. A great deal of our effort had been in that line. The author states great improvements were made in the last 5 years in the industrial appliances art, and also that the numbers on the market at the present time exceed those that could be obtained a few years ago. Another point mentioned is the value of a showroom. To my mind there is nothing else quite as valuable as to show a prospective consumer the machinery that you want to sell in operation. I do not believe mere advertising helps very much in the industrial business. Our experience is in a great many cases the man to whom you wish to sell an appliance could not see exactly how he was going to use the appliance in his business. In other words, we had to literally teach him, for sending advertising literature to that kind of a man would be almost useless. In our experience oil burning appliances compete very strongly with gas burning appliances. We find wherever the results can be obtained with an oil burning appliance it is impossible for us to get a gas appliance installed purely on the point of economy. The point is, however, that you cannot get the regulation with oil burning appliances that you can with gas, and in very many cases we eventually succeed in getting in our gas. [Applause.]

Mr. Eves—I do not wish to discuss the paper, but I wish to extend to every member of this Association an invitation to visit our com-

pletely equipped showroom of industrial appliances. If you have not time to go to see the installation itself, I would be glad to show here photographs that will give you an idea of it.

The President asked if anyone had anything to add to the discussion. Several had been asked to discuss the paper, some of whom were not in the room at the present time. If later on some would send in written discussions on it, these contributions would be printed in the proceedings.

Mr. G. M. Dolley—It would be a difficult matter to criticise or add anything to the paper prepared by Mr. McKee. He has covered the ground so thoroughly that all there is left to do is to impress upon gas companies the importance of pushing these appliances. The attitude most companies take toward industrial appliances at the present time could be compared with that to the gas range only a few years ago. Then a gas company, not figuring the gas range a necessity, did not push their sale. I can remember the advent of the gas range in the city where I was first employed in the gas business. Then the gas range was considered simply a luxury, to be enjoyed only by people with plenty of money; but by soliciting and advertising, the gas companies, with the help of the stove manufacturers, have made the gas range not only a luxury, but a necessity to be enjoyed by all classes. So it is with the industrial appliances. While the business is in its infancy, it will require hard work from the gas companies and manufacturers to bring this department of the gas business before the public in a way that the latter will feel it is a necessity. Having the gas range business at a point where it should not acquire so much time to make sales as in the past, why not devote part of our time and energies to the sale of industrial appliances? Most of the gas companies in this State would be handicapped in promoting the sales of industrial appliances, being too small to employ an experienced salesman for this line. And I do not think that the ordinary salesman is adapted for this line of work. The making of a successful campaign required an experienced man, and I am heartily in favor of the suggestion in Mr. McKee's paper that the manufacturers sending out qualified men to conduct a campaign in the territory where the size of the town will not permit the employing of a man in the regular way.

Completing the Davis Lecture.

The President—At the meeting last year President Graf recommended that the paper prepared jointly by Messrs. Dunbar and Davis, on "The Relation of Heat Value to Candle Power in Commercial Water and Coal Gas," be continued, inasmuch as it was a very live subject. These gentlemen acquiescing in the thought, said they would be glad to continue. Unavoidably Mr. Dunbar was unable to follow this out, in that certain apparatus he was expecting did not come in time, but a certain amount of investigating work was carried on at the plant of the Indianapolis Gas Company under the supervision of Mr. Davis. He is prepared to here report progress and give some of the data about his investigations, and in doing so he will for the purpose of condensing this rather more than could have been done ordinarily, also take up his paper on the "Natural Laws of Gases."

Mr. Davis said—Mr. President, Ladies and Gentlemen: Last year we reported come 700 tests on the relation of candle power to heat units, the idea being to determine whether or not a definite constant existed between candle power and heating value of gas. The work last year was all done at the plant of the Indianapolis Gas Company on gas made at that works, and since works' conditions vary, at the suggestion of Mr. Graf, the work was continued this year with the idea of getting additional date from other sources. Mr. Dunbar, however, was unable to get his apparatus installed in time, but in this report of progress I may say that I tabulated 666 additional tests made at the plant of the Indianapolis Gas Company. There were 111 tests of candle power and heat units (B.T.U.'s) each of commercial water and coal gas. As it is not necessary to give all of these, I will merely report the results, and show the constant we were calculating. You can readily see that, if we had a gas, of say 600 heat units, and 20-candle power, if we divided the candle power into the heat units we would get 30, as a constant. If candle power and heat units bear a constant relation to each other, that figure should remain constant over a wide variation; for instance, suppose we had a gas of 620 heat units, then we should find 21-candle power, so that the constant would still be 30, etc. The figures though show there is no constant, and that the variation is very wide. In coal gas I find a variation in constant of from 105 to 42; or a difference of 150½ per cent., and in the water gas a variation of from 26 to 37.5; that is a variation of 44.2 per cent. In the commercial gas (this commercial gas was taken from a 3-million capacity holder, in which the gas had every opportunity for perfect mixing) variations in the constants of from 29.9 to 35 were found, or a variation of 17.05 per cent. The conclusion drawn from this is identical with that stated last year. It can only be concluded that, while there is a general rise in the candle power in all of the gases, as the candle goes up the rise is not constant on individual tests and no accurate constant can be calculated. I might also call attention to the fact given in Dr. Parr's lecture yesterday afternoon (he did not give the authority) that there was no relation between candle power and heat units. This was stated as fact, and he apparently had determined that fact, or had very good authority for his statement. This concludes the first section of my lecture.

Discussion.

The President said they might discuss that part of the Davis lecture.

Mr. Danforth asked if there were an explainable reason for the fact that coal gas showed a variation of 150 per cent. in the constant, while the variation in water gas was 47 per cent., and the variation of 17 per cent. was traceable in the mixed article.

Mr. Thwing said he was preposing to ask Dr. Davis the same question. To the ordinary man it looked very peculiar that a combination of two gases would have a lower constant than either of its constituents. It might be possible a mistake was made when putting the figures on the board.

Mr. W. L. Battin said that as the time was brief he would do nothing further than to confirm Dr. Davis by saying it was thus shown how impossible it would be to have a double standard. They must insist on the single standard, which standard should be the gross calorific power of the gas. When gas was first used, candle power was a very important matter. The old State House at New Albany, Ind., was formerly lighted by candles, at the cost of $20 a night paid to a contractor who furnished the candles, lighting and extinguishing them too. When gas was introduced, the Capitol was one of the first places in which it was used. The legislative hall required about 1,000 cubic feet per night, at a cost of $4 per 1,000 cubic feet, so that there was a saving of $16, and the light was much more brilliant. Naturally, all reference to light was made in respect to its great candle power or advantage for giving light as compared with candles, because candles where what had been used for light and everybody was familiar with them. Likewise, when the electric arc was first discovered, it was so much more brilliant than any other light that it was spoken of as a 1,000-candle power, although, quaintly enough, the way the electricians arrived at this was by hanging a lamp up at the intersections of two streets and, although the light gave really only 250-candle power, inasmuch as it shone in 4 directions, they gave it the value of 1,000-candle power; but now that gas is so seldom burned in an open flame, the light giving value of gas as burned in that flame, is of little importance. The single standard of the gross calorific value of the gas should be insisted upon by all gas men.

Mr. Graf said he didn't want to take the position of answering the questions put to Dr. Davis; but some of those were things about which he wanted to speak. Anybody manufacturing coal gas knew that, during the different hours of carbonization, there was a great deal of difference in the quality of the yield. Suppose the gas showed a very low candle power. It might have been the top of a retort broke out, or that the tail-end of the charge was reached, but the fact that the tests on water gas and coal gas were made during the process of operation, and samples taken at the inlet of the station meter had a decided influence on the quality. In testing the mixed gas, the sample was taken from a 3 million foot holder, or where the gas has had a chance to mix thoroughly, so that one would get a better average. That would explain very fully why such variation existed, he thought it satisfactory to know that, in the mixed gas, there was so little variation between the candle power and British thermal units. It showed, while there was no definite relation between them, they still had the fact that as the candle power increases one was pretty sure to get increased heat units.

The President said, as no one else seemed desirous of speaking, he would ask Dr. Davis to close the discussion.

Dr. Davis thought Mr. Graf had answered the questions of Mr. Thwing and Mr. Danforth, at least in part. The variation of constant in the coal gas was largely due to the fact that some of the coal gas tests were purposely caught when some conditions existed in the work that would occasion an abnormally low candle power for a few minutes, at least, long enough to get a determination of the candle power and also the heat units of the same gas. He was unable to catch any wide variations in the water gas or they probably would have had as great a variation there. The very fact that there was such a small variation in the commercial gas was accounted for by the fact that the gas is all mixed in the 3 million foot holder, and that the gas was simply taken out of that holder after it had had considerable opportunity to mix.

Mr. Thwing asked Dr. Davis, as to that factor of 105; would Dr. Davis tell them what the relative values as to heat and candle power were?

Dr. Davis said the number should have been reversed. It should be 150 per cent. In this particular case the candle power was 4.8 and heat units were 505. A broken seal was the cause.

Mr. Thwing said as to the possibility of its being a broken seal with the admission of air that produced that candle power. Then would he imagine that the admission of sufficient air to produce a candle power of 4 or 5 would leave a heat value of over 500.

Dr. Davis said provided the air entered the right place through a leaking mouthpiece or a broken retort—where the continued formation of carbon dioxide (1 per cent.) would cut the candle power several per cent. A condition of that kind gave abnormally low candle power, but still showed 500 heat units.

Mr. Thwing said it looked remarkable that one with such low candle power could have such high units. He wished Mr. Battin would explain further the statement that coal and water gas could be mixed to considerable extent without affecting the candle value of the latter, for such had not been the experience of the speaker.

Mr. Battin said the only explanation he could give for the fact was the candle power of a mixed gas and water gas was higher than the average candle power that would be obtained by simple division. They made many tests in Chicago and determined considerable coal gas could be mixed with water gas before the candle power of the water gas would be reduced. He did not have the figures at hand, but believed about ½ of the mixture could be coal gas before the candle power was lowered. The first time they came across this was through noticing when the Semet-Solvay gas was run through mains that hitherto only carried water gas, there was an increase in candle power. They then tried out two large holders, side-by-side, purging one of them thoroughly with coal gas, the other with water gas and got by test the same result. They then thought possibly the increased candle power might be due to oil vapors on top of the water in the holder, so they took 2 small experimental holders thoroughly clean and obtained the same result. Trying to explain the matter they thought the flame temperature possibly accounted for it, but such tests showed the flame temperature of water gas and coal gas was practically the same; also, that of the mixture was about the same, wherefore, flame temperatures were not an available explanation. They finally decided that perhaps the shape of the flame had something to do with it, water gas having a broad flame and coal gas a tall one, whereas the flame of the mixed gas was almost circular in shape. They concluded that possibly this shape of flame was responsible for the high candle power, but this, of course, did not explain it satisfactorily to themselves. They simply know it to be the case. The results were obtained from the flat flame.

Dr. Davis—I don't believe I have anything more to add to this. The figures that I have given were taken actually from the records of daily operations of the works. They are not experimental results at all but are such as are liable to occur in any large works.

A Member asked if there were a chemical reaction that could take place on mixing coal and water gas so as to leave more of the carbon free from the incandescent flame. Would there be a rearrangement which could possibly account for that fact.

Dr. Davis said that before the gas was actually burned there would be no chemical reaction on merely mixing the gases. The combustion of gases in the flame was something that had been worked on for many years by a number of excellent chemists in various parts of the world and it constitutes one of the most difficult problems of chemistry. That was to take the gases right at the flame, separate and analyse them to get their combustion composition. He could give very little information about flame composition and the like, because very little was known about it.

The President said they would take up the next part of Dr. Davis' address, on the

NATURAL LAWS OF GASES.

Dr. Davis—I expressed the opinion to some friends that the gas man, as a rule, comes in contact very little with gas theory, and a man with a thorough knowledge of the theory of gas, or the natural gas laws, is much more fitted to combat daily problems that occur in his work than the man who has not this knowledge. It occurred to me that a paper on the natural gas laws, something that could be illustrated, might be interesting. I may say in working up this paper I learned a great deal myself, because many of the laws I ran across were in a way new to me although I have been a gas chemist for a good while, and I can realize how readily a man may get out of the way of a knowledge of these laws even though he once had it.

One of these laws comes into use almost every day in the service department of a gas company, and I believe that the men actually using the apparatus do not realize that that law is coming into play. It is the law of partial pressures. The little leak detector that is used in detecting a leak usually consists of a diaphragm with a porous plate on the back, and, placing the leak detector in the presence of any gas leak, some of the gas leaks in between the diaphragm and plate and will exert its own partial pressure and throw the needle around and indicate a certain percentage of gas present in the air. I will illustrate how the law of partial pressures works. Here is an ordinary porous cup made of clay. I have this porous cup sealed into a glass funnel with sealing wax and the tube running into and through the stopper into the water. You can readily see that any pressure exerted on the funnel would make a pressure inside of the bottle and blow the water out of the top. The remarkable thing is how this law of partial pressures works. I have here a bell jar full of hydrogen and I am going to lower the bell glass of hydrogen right over this porous cup. It will merely diffuse in through the porous cup of its own accord and should exert enough of its own partial pressure to blow the water out of the top. Sometimes this experiment does not work. [The experiment was very successful.]

You see there was no seal at all. I merely let the bell jar down. There is enough hydrogen still in there to shoot it up again. Merely the diffusion of hydrogen through the porous cup exerts its own partial pressure on the water and forces it out. An interesting point is right there. In gases of varying specific gravity one will exert its partial pressure in a closed vessel. Take for instance a mixture of coal and water gas, the former having a specific gravity of .44 and the latter one of .65. In the many of gas works in this State think of the enormous power thrown away because we have no practical way of utilizing that. I raised probably ¼ pound of water 2 feet high. But in mixing millions of feet of gas if that partial pressure could be confined and used in some way probably we would get enough in the mixing of our gas to run part of our machinery. A thing that happened in the patent office all the time was the filing of patents on all kind of combustion apparatus; for instance, he found there were 2,600 distinct patents on oil gas machines, many of which were utterly useless. A very large number of people were continually working on processes for taking nitrogen out of the air and making oxygen gas at a very cheap rate and supplying oxygen gas under a boiler to get combustion for firing boilers, or any application of fuel. They argued in this way: "If we could only supply our boilers with pure oxygen we would get a small volume of flue gas and a consequent great fuel economy." Hence, they say we will patent a process to burn our coal with pure oxygen, provided we can find a process. And I want to show you a little experiment, illustrating what might happen if the atmosphere of the earth were pure oxygen, or if we tried to supply pure oxygen to a fire under a boiler. I have here a small, ordinary piece of mainspring out of a watch, almost pure steel, and a little bit of sulphur on the end to light it, and the nice thing about it is if we had all the atmosphere of the earth made of oxygen, we could then have our matches made of steel springs. Sometimes this doesn't work; but I will see if I can make it work. [The experiment was most successful.]

So you see if our air were pure oxygen and our gasholder caught fire it would burn up. One thing that becomes very important, you know, oftentimes in a gasworks is the specific gravity of our gas. Normal coal gas of good character has a specific gravity of about .44 to .45. If you have a leaking retort making carbon dioxide it will surprise you how much that gravity will go up. Knowing this to be a fact sometime ago I began to experiment on a gas gravity balance. After considerable experiment I devised this balance, blown entirely of gas. It is a balance on the order of the Lux balance which is on the market, only that that balance has metal bearings and many corrosive parts for which reason I have had all parts of this balance made of glass. The beam of the balance is made of glass with a pointer on it. The gas is gotten in and out of that globe through the mercury seals. I slightly upset the standard of this balance in bringing it down here. It is not quite accurate to-day, up to this time it has been very accurately adjusted. About 2 years ago Sir William Ramsey, University College, London, discovered 5 new elements in the atmosphere, all rare gases existing in most cases in very small quantity. They were called Argon, Krypton, Helium, Neon and Xenon. Argon exists one part in 906 parts of air; Xenon, 6/10 part in 10 million parts of air; the others range in between in rarity. The gases isolated by fractional distillation of liquid air; Helium (boiling lowest) comes off first; Xenon (boiling highest) is left in the residue. I will show spectrum tubes of all these gases. The Neon, as will be seen, gives a very bright light due to the fact that its electrical cohesion is only 8, while air is about 450; in fact, this property causes pure Neon to shine in the dark when merely shaken up with mercury. The owner of the liquid air works in Paris recently made a Neon tube, about 13 feet long and 2 inches in diameter, which gave a light of 1,200 candle power. It may, therefore, become commercially important.

Discussion.

The President said they had been very much entertained with the latter part of Dr. Davis' lecture, and he called on Mr. Thwing to open the discussion.

Mr. Thwing said there was possibility of a discussion on Dr. Davis' very interesting experiments, but he felt about all they could say was to express their thorough appreciation of the information he had given them. Many years ago, when the speaker thought he knew something as to what was going on in the chemical line, but on coming into contact with gentlemen like Dr. Davis he began to think he was away behind the procession. He would like to ask Dr. Davis why, when he applied the bell jar of hydrogen to that tube, the hydrogen penetrated so quickly and drove the water out and when he removed the jar the diffusion was all apparently through the tube at the top, but the air had to work back through the discharged tube at the bottom. That was interesting to him and he could hardly under-

stand why the pressure worked so quickly and the reaction took place so slowly.

Dr. Davis said the reason that that effect was not obvious to Mr. Thwing probably was because he neglected to state one very important law of gases—the law of diffusion, rather, of the rate of diffusion. The law was like this: A gas would diffuse through any orifice at a rate inversely proportional to the same rate square root of its gravity. Now, the gravity of hydrogen being about .07, was about $\frac{1}{14}$ as heavy as the air. Since it diffuses at a rate inversely proportional to the square root of its gravity, the hydrogen gas, on account of its being so very light, diffuses through that porous cup at a very rapid rate. As the specific gravity of the air is one, on account of its high specific gravity it cannot diffuse out nearly so quick as the hydrogen diffuses in.

Mr. Battin asked Dr. Davis whether it would be feasible to use a porous material on that account to do the very thing he said 4,200 people had tried to do; which was, to separate the nitrogen from the oxygen in the air. In other words could a material be made by which one could be separated from the other.

Dr. Davis said that was scarcely possible. The only way it could be done would be by using the so-called semi-permeable membranes. At least, so far as he knew, no semi-permeable membrane had been found capable of separating gases, although some had been found that would easily separate solutions of solids. About the only method he knew of for separating gases in great quantity was the method of a plant in Buffalo (the Linde Air Products Company) which was operating very successfully.

Routine Business.

The President said it might be well to take up a few business matters. For instance, there was action to be taken on the Report of the Executive Committee, presented the day before.

At the suggestion of Mr. Olds the reports were re-read, and (on motion of Mr. Travers) the amendment to by-laws suggested was declared adopted. Mr. Olds here assumed the Chair, and Mr. Graf read the following

Report from Committee on President's Address.

To the Members of the Indiana Gas Association: Our President's address is well worthy of careful consideration and study. While we do not agree that *most* gas companies are operating "in restraint of trade," by failing to give that "service" that is now necessary for success, we know there are many by whom this advice should be heeded. It is, however, somewhat of a question, as to how far we may carry on our gratuitous work, in the way of appliance repairs, etc., without having this feature become a menace to our profits. It is a well-known fact that the gratuitous work of the ordinary gas company is many times more than that of any other business concern.

We concur with our President in the thought that we are not realizing the maximum efficiency of our Association. The papers presented before our meetings are always helpful, but there are also many matters, of vital and mutual interest to the members of our Association, that should be given more consideration.

We recommend the establishing of a Bureau of Information, as suggested by our President, for the assistance of our members. Such a bureau will not only be a benefit to individual members in their times of need, but will be a most interesting feature of the regular Association "Proceedings."

We recommend that the Secretary of this Association extend our compliments to the new Ohio Association, and our offer to co-operate with it in any way that may be of mutual benefit.

Respectfully submitted, Carl H. Graf, O. O. Thwing, S. T. Murdock, } Committee.

The Vice-President asked the pleasure of the members respecting the report, and, on motion of Mr. Dolley [seconded] the address was adopted.

(To be Continued.)

Recent Patent Issues.

Prepared for the American Gas Light Journal by Royal E. Burnham, solicitor of patents and counselor in patent causes, 833 Bond Building, Washington, D. C., from whom illustrations and specifications of any patent mentioned below may be obtained for 20 cents.

1,017,654. Safety Connection for Gas Fixtures. G. de Grey, Philadelphia, Pa.
1,017,751. Gas Log. O. E. Hansen, Perth Amboy, N. J.
1,018,033. Steam Pipe for Gasholders. W. A. Crammond, New York City.
1.018,152. Vaporizer for Gas Producers. C. J. Atkinson, Watertown, Wis.
1,018,235. Apparatus for Extracting or Separating Suspended Matter from Gases. F. W. Burstall, Birmingham, England.
1,018,350. Gas Cock. L. Bedard, Quebec, Canada.

Items of Interest
FROM VARIOUS LOCALITIES.

That the fortunes of the Macon (Ga.) Gas Company (which corporation, as our readers know, has been completely divorced from the water supply of that sprightly Southern city) are prospering under the Powell-Wood-Redding regime is well proved by the following welcome mention respecting the corporation, forwarded us by one who has had much to do with rehabilitating the enterprise that was formerly a jewel in the business crown of that most estimable gas man, Mr. Arthur E. Boardman: To the Editors, American Gas Light Journal: You may be interested in having a word from Macon as to what is being done to promote the gas interests of that city. On account of the rapid growth of the business of the Company it was found necessary some months ago to erect its own office building at 220 Second street. Further improvements which were found advisable consist of about 12 miles of mains, which extensions will reinforce the present distribution system for the supply of gas to the suburban territories of South Macon, Crump's Park and North Highland. These extensions will result in the placing of 500 to 600 additional consumers on the lines. Contracts have been let for this piping, and active work thereon will be commenced in a few days. The rapid increase in business also made it necessary to construct a holder equal to retaining one-half million cubic feet, and will bring the total dependable storage up to 700,000 cubic feet. The contract for this has just been awarded, and it is to be completed by September 1st. In addition to the holder, a 36-inch ammonia concentrator is to be placed, also a new elevator for hoisting coal to the charging floor, and provision is to be made for a water supply owned by the Company. By way of comment respecting the office building, it may be pertinent to remark that the Macon Railway and Light Company, the Central Georgia Power Company and the Central Georgia Transmission Company—these concerns, by the-way, are all under the control of the capitalists who own the Macon Gas Company—have moved their headquarters into the new premises. In addition to the betterments and extensions listed above, the Company is proposing to erect a storeroom, also a barn, to properly take care of the supplies and live stock incident to the operation of the Companies named.

All of which goes to show that General Manager Redding and his men were close to the job during last fall and this winter.

Mr. George F. Blood has resigned from the service of the Ruud Automatic Water Heater Company's Boston division, to accept a higher post on the force of the Humphrey Automatic Water Heating Company, with headquarters in Kalamazoo, Mich. He will represent it in the Northeastern territory, and is a brother of Mr. Chas. E. Blood, who, as representative of the General Gas Light Company in its Eastern division, is usually on hand when anything in the shape of an order is even tentatively in sight. By-the-way, C. E. Blood is the chap who "put it over" on "Jim." Conroy, the General Company's popular Eastern General Agent. The way the story[1] is told is about like this: Blood was visiting Mr. Conroy, in the latter's latchless home in the Orange (N. J.) hills, at the time when "Con's" first-born was being baptized. After the ceremony, Blood remarked to the proud father, "Boss, that youngster ought to find his way along the dark paths of the earth quite easily." "Why so," inquired Mr. Conroy. "Look at his first given initials," said Blood. Sure enough, there they stood out in bold relief, "A. R. C.," meaning Arthur R. Conroy!—M. M. V.

"H." forwards the following under recent date: "Elmer Dover, former Secretary of the Republican National Committee for a number of years, including the year (1904) made memorable by the Roosevelt rooters, has been appointed President and General Manager of the Tacoma (Wash.) Gas Company, a utility property controlled and operated by the Messrs. H. M. Byllesby & Co., whose service he entered in 1908. On taking charge of the Tacoma property one of his first official acts was to arrange for a series of staff meetings of those connected with the corporation. The initial meeting was held at noon of January 24th, when Mr. Dover and the departmental heads, seated at luncheon, discussed matters of interest and importance to the corporation. Possibly the time taken up was 1½ hours. Some days later all solicitors, in fact, all outside men connected with the new business department, met with the staff officers to compare notes, receive advice, etc., on matters connected with that division. This gathering

1. This is not new; but rather than "spoil" his story we will allow "M. M. V." to retell it.

lasted well over 3 hours. The preliminaries seemed so fruitful that regular meetings have been carded. That practical results are aimed at in direct fashion can readily be seen from the programme for the third session, which was to be given over altogether to the work carried on by the meter readers. The Manager sees to it that all employees who are expected to attend the conferences are advised of same well in advance, together with a topic sheet, on which is outlined certain matter that may be taken up at or during the session, thus giving the men opportunity to prepare themselves for the session." Our informant closes his story in this fashion: "It cannot be doubted but that these 'cabinet meetings' will produce good results in the way of gaining better understanding, promoting harmony and increasing the efficiency of all concerned."

THE Public Service Commission, Second New York District, has assented to the petition of the Syracuse Lighting Company for permission to exercise its rights and privileges to supply gas to the residents of the outlying territory known as Salina.

MR. ERNEST V. HOWE, formerly Superintendent of the Leominster (Mass.) Gas Light Company, has taken charge as Superintendent of the properties of the Arlington (Mass.) Gas Light Company. Both Companies are controlled by the Massachusetts Lighting Companies.

MR. FRANKLIN H. RUDD has severed his editorial connection with "Telephony," in order to become a member of the organization of "The Traffic Service Bureau," Chicago and Washington, D. C.

THE plant of the Florence (S. C.) Gas Company will be located on a plot at the northern end of Irby street, contiguous to the Cheraw and Darlington Road. Sidings from both the Atlantic Coast Line and the Seaboard Air Line will run into the yards.

FROM the annual report of the operations of the Brooklyn (N. Y) Borough Gas Company, which corporation sells gas to the residents of the Coney Island and Gravesend districts of Greater New York, it is seen that the net profit for the year, to December 31, 1911, amounted to $28,964. The total output was 244,493,900 cubic feet, and the income was $237,944, plus $6,653, received from other than sales of gas. Expenses absorbed $114,282 (operation account), plus interest, taxes, mortgages, amounting to $101,401. The meters in use (7,877) showed an increase for the year of 952; or about 15 per cent. gain. During the year 33,349 feet of new mains (from 4 inches to 20 inches diameter) were laid, at a cost of $37,399. The total figures to 92.4 miles. The surplus account is returned at $144,162.

DURING the recent fire in Houston, Tex., the Gas Company lost 25 meters, and the total gas lost was about 210,000 cubic feet.

THE Ideal Gas and Electric Fixture Company, which concern has been lingering along from a business standpoint, in the premises, 224 Canal street, New York, finally asked the aid of the Sheriff to wind up its affairs. The initial examination of the books, on bankruptcy account and proceedings, shows liabilities of $27,598, and assets of $12,654—the latter includes accounts collectable of only $1,400.

A PARTY named Thomas H. Dow, who declares he is the "Business Agent"—whatever that may be in the labor world—of the Boston Firemen and Enginoers' Union, some days ago filed a protest in the Boston City Hall respecting the plan followed by the Consolidated Gas Company of that city, in employing help through paid employment agencies, rather than from the free State employment office, or the Union office of the aforesaid Society.

THE Omaha *Bee* buzzes the information that Mayor Dohlman of that city has signed the resolution of Council appropriating the sum of $4,000, to be paid to Mr. James Hall, of Chicago, for an appraising of the local gas plant, such appraising to be related to the better understanding of the efforts of the municipality to secure a reduction in the gas rate. This proceeding, so far on the city's part, as it lengthens, all the more takes on the appearance of a mess of very cheap political buncombe.

THE Central Georgia Power Company, since the 1st inst., has been in undisputed control actually of the operating of the Macon Gas Company.

ON the 1st inst. the American Gas and Electric Company declared a 20 per cent. stock dividend. Under the plan the Company allots present holders new stock at par to the extent of 20 per cent. of holdings, as of record the 15th inst. Owners of common stock of record will then have the right to subscribe at par ($50) to 20 per cent. of their holdings on that date, payment to be made thus: April 15, 50 per cent.; July 1, 50 per cent. It is further agreed that payments made on or before April 15 will receive 5 per cent. interest from April 15 to July 1 on such payments. Subscribers may anticipate final payment after April 15, and such payments shall bear interest at 5 per cent. from April 15 to July 1.

THE fruition of the scheme for the consolidating of the properties of the separate Companies at Lambertville, N. J., and vicinity, under the title of the Northern New Jersey Gas Company, is an announcement that the gas rate has been reduced to $1.65 per 1,000; a cut of 20 cents.

MR. JUSTICE MARCUS, having issued a writ ordering the dissolution of the Medina)N. Y.) Gas Company, Mr. M. M. Childs has been appointed Receiver for the properties, under a bond in the sum of $5,000.

"B. B. R.," writing from Los Angeles, Cal., under date of Feb. 28, says: "Gas to supply the residents of the contiguous or adjoining districts of Lindsay, Exeter, Porterville, Terra Bella and Strathmore is to be made in a plant located in Lindsay, to be distributed therefrom under high pressure to the places named. That is, if the tentative plans of the Central Counties Gas Company, of California, are carried out."

WE are indebted to one who was there for the following mention published in the New Britain (Conn.) *Herald*, dated the 29th inst.: "Seated around the festive board at Caterer Boedeck's hall, the employees of the New Britain Gas Light Company last evening enjoyed their annual dinner. Mr. Howard F. Sloper, General Manager of the Company, acted as Toastmaster, and his pertinacity succeeded in bringing out speeches from the various departmental Chiefs. Following the excellent supper a programme by Hartford talent was given, the vaudeville features of which would do credit if shown on a stage of the truly theatric sort. Mr. O'Keefe spoke a monologue or two, Mr. S. Leaventhal rendered a beautiful violin selection (he was accompanied on the piano by Mr. Walter Gaylord), and songs were twittered by Master R. C. Parmelee, the boy soprano of Hartford. Mr. Philip Molander played excellently a few well-chosen piano selections, and a magical act was satisfactorily set forth by Messrs. Ring and Hubbard, who of a verity earned the title of past master in the 'black arts.' The Entertainment Committee was thus made up: Messrs. H. F. Hodge, Henry Holsing and O. E. Erickson. The Supper Committee comprised Messrs. 'Fred.' Lancaster, Thomas Taylor and James Fox."

THE Nogales (Ariz.) Gas Works was sold at auction the 24th ult., to Frank E. Curley, of Tucson, at his bid of $6,000. The sale was subsequently confirmed by the Superior Court. Eastern bondholders bought in the junk.

MR. JOHN J. DENVER has succeeded Mr. Joseph Hinchcliffe as Secretary of the Elkton (Md.) Gas Company, resigned. Mr. Hinchcliffe was in the Company's employment since 1869.

AN ordinance reducing the gas rate in Richmond, Va., from 90 cents to 80 cents per 1,000 cubic feet was offered for the consideration of the Richmond Common Council on March 4th. The proposer was Mr. George M. Cease, of the Committee on Light. While our informant does not seem disposed to openly object to the proposed concession, nevertheless, he remarks that these lines respecting the subject, from a recent article in the local *Dispatch* are all to the point. * * * "There are many ways of calculating the profits of the gas works. Taking as the actual basis the annual report of Auditor Warren to the Committee on Finance, it shows that the city received from the sale of gas and the sale of such by-products as coke and coal tar, a total (1911) of $421,384.48. During the same period the total amounts paid out, according to the Auditor's report, for coal and oil, pay rolls and expenses, amounted to $271,644.65, leaving a gross profit from last year's operation of $149,739.83. This, however, is subject to interest on the investment, the gas works being assessed at $3,510,000. Interest on the outlay, therefore, at 4 per cent. would amount to $140,000, to which must be added a percentage for depreciation and replacement, and the other fixed charges that should go against a manufacturing plant."

The Market for Gas Securities.

The quotations for Consolidated gas to-day (Friday) are identical with those for Friday week, 140 to 140¼. The figures remained without net change, notwithstanding there was considerable activity in the shares, possibly a total of 3,000 having changed hands, as per the Stock Exchange records for the last 6 days. The Sullivan bill to cut the rate on Manhattan Island to 70 cents per 1,000 cubic feet is seemingly sleeping, the sleep of the unjust. The "thaw preliminaries" seem to have set in, and the ravages to mains occasioned by the exceeding depth to which the frost has fixed the ground, will cost the Companies of this vicinity many thousands of dollars. The top covering of earth here in New York will not average much more than 3 feet, and the average penetration of the frost over the city will exceed 3 feet 6 inches. So far in the upheaving the cement joint seems to have been the weaker joint.

Brooklyn Union is dull and steady. The Woonsocket (R. I.) Gas Company has increased its capital to $450,000. It was $200,000. At the annual meeting of the Board of Directors, Laclede Gas Light Company, St. Louis, the dual office of Vice-President and General Manager was discontinued, and Mr. Charles L. Holman was elected President. His associates are: Vice-President, R. H. Walker; Secy.-Treas., W. H. Whitton, The general situation in out-of-town shares favor the investor.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

MARCH 11.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked*
Consolidated Gas Co.	$73,177,000	100	140	140¼
Central Union Gas Co.— 1st 5's, due 1972, J. & J.	8,000,000	1,000	103	105
Equitable Gas Light Co.— Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	3,500,000	100	165	175
New Amsterdam Gas Co.— 1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	101	102⅛
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	—	98¼	100½
New York and East River— 1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	95	100
Northern Union— 1st 5's, due 1927, J. & J.	1,250,000	1,000	100	102
Standard	5,000,000	100	61	70
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	138	140
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	299,650	509	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	½	¾
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	35
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed Gold Bonds	7,680,000	1,000	104	106¼
Cincinnati Gas and Electric Co.	29,500,000	100	87	90
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. & Heating Co.	1,682,750	100	90½	91
Preferred	3,026,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	13,460,084	—		—
Mortgages, 5's	3,400,000	—		—
General Mortgage 4½'s	10,661,000	—		—
Con. Gas Co., Baltimore City, 4½'s	2,751,000	—		—
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	94	96
Bonds	75,000	—	—	100
Essex and Hudson Gas Co.	6,500,000	—	133	136
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co., 1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	—	130	138
" Bonds, 5's	10,500,000	—	101	106
Indianapolis	2,000,000	—	—	38
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	91	95
Kansas City Gas Light Co., of Missouri	5,000,000	100	—	38
Bonds, 1st 5's	3,822,000	1,000	99	102
Laclede Gas Co., St. Louis.	10,000,000	100	105	105¼
Preferred	2,500,006	100	114	120
Bonds	10,000,000	1,000	102⅜	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	108¾
Massachusetts Gas Companies, of Boston	25,000,000	100	92⅛	92¾
Preferred	25,000,000	100	97¾	98
Montreal Gas Co., Canada	2,000,000	100	218	218¼
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	2,000,000	25	200	—
Peoples Gas Lt. & Coke Co., Chicago	25,000,000	100	106⅛	106¾
1st Mortgage	20,100,000	1,000	102	102⅛
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104⅛	105⅛
Pacific Gas and Electric Co.	15,500,000	—	53⅛	55
St. Joseph Gas Co.— 1st Mtg. 5's	1,000,000	1,000	96	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	105
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,600,000	200	420	425
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, October 16 to 18, 1912. Atlantic City, N. J. Officers: President, Ira C. Copley, Aurora, Ills. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting, ———— Officers: President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keillor, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 1912. Officers: President, R. M. Searle, Rochester, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street. New York City.

Gas Meeters.—Monthly meetings. Chairman, I. W. Peffy; Secretary, H Thurston Owens, 42 Pine street, New York City.

Guild of Gas Managers of New England.—Annual meeting, March, 1912. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, time, March 20 and 21, 1912, Auditorium Hotel, Chicago, Ills. Officers: President, C. B. Strohn, Elgin, Ills.; Secretary-Treasurer, F. E. Newberry, Dixon, Ills.

Illuminating Engineering Society.—Annual meeting, Sept. ————1912, ———— Meetings of Sections, monthly. Pres't, A. E. Kennelly, Boston, Mass.; Secretary, Preston S. Miliar, 29 W. 39th street, N. Y. City. Sections: New York, Secretary, Albert J. Marshall, 16 East 40th street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, A. L. Eustice, 105 North Wabash avenue.

Indiana Gas Association.—Annual meeting, March, 1913, Indianapolis. Officers: President, Howard L. Olds, Indianapolis; Vice-President, Wm. Wallace, Lafayette; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, time, May, 22, 23 and 24, 1912; Lincoln, Neb. Officers: President, G. W. Clabaugh, Omaha, Neb.; Secretary and Treasurer, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, time, Oct. 17-19. Manhattan, Kas. Officers: President, B. F. Eyer, Manhattan, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association.—Annual meeting, time, Sept. ————1912;———— Officers: President, F. W. Blowers, Kalamazoo, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1912; St. Louis, Mo. Officers: President, F. E. Murray, Louisiana, Mo.; Secretary and Treasurer, N. J. Cunningham, Springfield, Mo.

National Commercial Gas Association.—Annual meeting, Dec. 2-5, 1912. Atlanta, Ga. Officers: President, C. L. Holman, St. Louis, Mo.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, May, 1912, Kansas City, Mo.; Officers: President, A. B. Macbeth, Independence, Kas. Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, February, ————1913. Boston. Officers: President, D. D Barnum, Worcester, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—President, William H. Pettes, Newark, N. J.; Secretary-Treasurer, Arthur H. Osborn, Belmar, N. J.

Ohio Gas Association.—Annual meeting, February ———, 1913, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—President, Noel R. Gascho, Alva Okla.; Secretary, H. V. Bozell, Norman, Okla.

Pacific Coast Gas Association.—Annual meeting, San Diego, Cal., September 17, 18, 19, 1912. Officers: President, W. Baurhyte, Los Angeles, Cal.; Vice-President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, John A. Britton, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, Williamsport, Pa., April 10-12, 1912. Officers, President, W. B. Rhodes, Williamsport, Pa.; Secretary-Treasurer, W. O Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting, Dec., 13, 1912; monthly meeting, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, April 17-19, 1912, Jacksonville, Fla. Officers: President, H. B. Hoyt, Jacksonville, Fla.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. April 25, 26, 27, 1912, San Antonio, Tex. Officers: President, J. E. Carroll, Beaumont, Tex.; Secretary, D. G. Fisher, Dallas, Tex.

Wisconsin Gas Association.—Annual meeting, May 15 and 16, 1912, Milwaukee, Wis. Officers: President, H. M. Buck, Waukesha, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.